THE APPLICATION OF SHIPBOARD DAMAGE CONTROL TECHNIQUES TO INDUSTRY

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ABSTRACT

American industry expends substantial sums for fire protection, fire prevention programs, first-aid facilities, and industrial safety programs. These expenditures grow out of proper recognition of the economic necessity to minimize loss caused by disasters such as fire, flood, explosion, etc.

There is, however, the general lack of a program which pre-assigns specific responsibilities to employees, upon the occurrence of an emergency situation, which could reduce significantly the extent of damage.

The purpose of this paper is to present a model industrial disaster control plan which was developed for use at the Overhaul and Repair Facility, Naval Air Station, Jacksonville, Florida, and which utilizes those techniques heretofore applied primarily by shipboard Damage Control organizations.

The industrial manager alone can decide whether a similar application of Damage Control principles within his organization can be beneficial. To facilitate the making of this decision, a cost equation for use in computing plan implementation costs is provided. Further, the paper presents a method of approach, involving Simulation techniques, for individual company assessment of the potential value of plan installation in addition to the benefit derived by reduction of actual physical loss.

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CHAPTER I

THE NEED FOR CHANGE

COMPARATIVE PERSPECTIVES OF SHIP DESIGNERS AND SHIP OPERATORS AS RELATED TO DAMAGE CONTROL

The present-day Naval attack carrier with its mobility, speed, and strike capability represents different things to different people. To a potential aggressor, it represents a deterrent force which for adaptability and flexibility is unparalleled by any other weapon system in being today. To the average American citizen, it represents one of a vast array of instruments designed for his protection, and not incidentally, one of the reasons why he is relieved of the problems attendant to spending approximately 20% of his income. To the builders and operators of this awesome weapon, it represents the lessons learned through research, operation, and often sad experience in the effort to produce an effective platform for the launching and recovery of aircraft.

It is by addressal to the working principles developed by the last mentioned group that we expect to show the possibilities for similar application to industry.

It would be an unwarranted oversimplification to say that the designers of a Naval vessel concern themselves with only the immediate operational requirements involved in its use. They must also concern themselves with ways to limit flooding if it does occur, with maintaining stability by counter-flooding, with strengthening weakened structural

members, with the fighting of fire, and with the clearing away of wreckage. Officers and crew must maintain an organization comprised of personnel, equipment, routine drills, and special procedures designed to minimize the effects of damage sustained by a ship.

DEVELOPMENT OF NAVAL DAMAGE CONTROL CONCEPT

Further, it would be historically inaccurate to say that shipboard Damage Control techniques have enjoyed a steadily expanding growth over the years. It was not until the early days of World War II that Damage Control began to receive the interest and attention appropriate to its importance. During this period, understandable concern was in evidence over attempts to explain why one ship, after sustaining a certain amount and type of battle damage, was lost, and another similar type ship, after receiving substantially the same damage, survived to fight again. On investigation, the explanation was invariably grounded in what actions had been taken by the crew--before and after the battle--to minimize the effect of damage.

OBJECTIVES OF NAVAL DAMAGE CONTROL

Out of this experience with Naval ships has emerged the body of knowledge and procedure broadly described as Damage Control, and intended for use in attaining the following basic objectives:[1] 1) To

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[1]Bureau of Ships Technical Manual (NavShips 250-000-88) Sec. II (Washington: Government Printing Office, 1961), p. 505.

take all practicable preliminary measures, before damage occurs, such as maintenance of watertight integrity and fumetight integrity, provision of reserve buoyancy and stability, removal of fire hazards, and upkeep and distribution of emergency equipment, 2) To minimize and localize such damage as does occur, by such measures as control of flooding, preservation of stability and buoyancy, combating fire, and first-aid treatment of personnel, 3) to accomplish as quickly as possible emergency repairs or restorations, after the occurrence of damage, by measures such as supplying of casualty power, regaining of a safe margin of stability and buoyancy, replacement of essential structure, and manning of essential equipment.

DAMAGE CONTROL TRAINING PHASES: PASSIVE AND ACTIVE

Damage Control training aboard a ship revolves around two phases: the passive and the active phase. The passive phase concerns those steps which can be taken in advance of impending, forecast, or potential emergency which will reduce the possibility of spreading damage; such steps as the closing of doors, the re-routing of steam, the securing of unneeded electrical circuits, the purging of unused fuel lines, the securing of ventilation systems, the activation of emergency communication systems, and the donning of protective personnel equipment are all examples of "passive" damage control measures. All of these steps may be accomplished in advance of, for instance, a bomb attack or a forecast storm, and each one in itself could minimize the possibility

of personal injury. The other phase, the active phase of Damage Control is that portion which takes place after an incident, such as a bomb hit, an explosion, or an outbreak of fire. Such incidents would create the scene for the introduction of personnel specially trained in rapid recovery action.

A meaningful illustration of the value of a highly developed Damage Control organization can be drawn through description of an engine room fire occurring aboard the attack carrier USS SARATOGA off the coast of Greece in 1961.

A fuel line had parted and sprayed hot fuel oil over several pieces of rotating equipment in the ship's number 2 engine room; instantly there was a flash fire that engulfed the entire combination engine and boiler room. The alarm was spread, and immediately, personnel throughout the ship who had been trained to the point of automatic reaction, began to take action appropriate to the nature of the emergency. Ventilating systems for the engine room were secured to deny a necessary element of combustion; electrical circuitry in the immediate area of the fire was deenergized, and those circuits that could not be opened without affecting the ship's ability to remain fully operational were rerouted around the fire; auxiliary propulsion systems were placed "on the line" to maintain ship mobility; trained fire fighting and first-aid teams were mustered, briefed on the location and nature of the fire, and dispatched to the scene.

This fire claimed the lives of seven men; however, had proper

training and indoctrination of the crew in Damage Control not taken place, had scheduled and unscheduled drills in Damage Control procedures not been made a part of the ship's training routine until the crew reaction was immediate upon receipt of the alarm, the loss of seven lives conceivably could have been multiplied many times over.

SARATOGA lost little of her mobility and speed throughout the entire period that the fire was being contained and brought under control, and the ship was in a position at all times to launch and recover her aircraft on a moment's notice had the need developed.

Incidents such as this have shown the potential value of a coordinated plan of action within each operating unit of the Navy for dealing with unforeseen events--and equally important, they show the absolute necessity for continuing efforts in this area to develop better methods and procedures, to build ships with awareness of the problems of effective Damage Control, and to recognize that the need for crew training is of utmost importance.

<u>THE APPLICATION OF NAVAL DAMAGE CONTROL PRINCIPLES TO AMERICAN INDUSTRY</u>

Do these shipboard concepts of active and passive Damage Control with their accompanying organization of personnel, equipment, and training have any application in a shore industrial environment? More specifically, is there any value to be derived from the formulation and implementation of a Disaster Control plan in American industry that, with a proper approach, can draw upon the knowledge and experience of

on-the-job employees in minimizing damage from fire, flood, hurricanes, and internally or externally caused explosions?

CURRENT GROWTH TRENDS IN AMERICAN INDUSTRY

An answer suggests itself through the consideration of some current trends in American industry. First, the growth of the American industrial plant is one of the miracles of the twentieth century. Its production marvels were major factors in winning two world wars; yet its very bigness has brought with it "Damage Control" problems of major proportion. Plant areas of a million or more square feet no longer are uncommon. Tank farms, warehouses and factories that stretch for thousands of feet are to be found in nearly every state. It is axiomatic that the bigger the pile of fuel, the bigger the fire. Many industrial plants today represent enormous piles of flammable and explosive material subject to what is called exposure to a single fire.

Along with increases in the size of plants have come increases in areas within plants that are without subdivision by fire walls, fire curtains, or other forms of protection. In many modern industrial plants it is possible for a fire to rage 800 to 1000 feet through a building without encountering any obstacles to its progress. Some are so huge that the municipal fire department can reach only a small area of the plant with its hose streams. In many cases the fire may actually burn itself out before the firemen can approach its center.

Another hazard is the practice of building windowless plants. It

is virtually impossible for firemen to get at the fire in such structures, and often they provide a screen behind which the fire may burn uncontrolled for hours.

In seeking to gain the benefit of lower tax assessment values, additional land space to allow for plant expansion, easier accessibility for employees, etc., there is a definite tendency to locate plants in the proximity of cities rather than within their corporate limits.[2] But in so doing, companies are acquiring these benefits in exchange for the advantages of fully-manned municipal fire departments, high pressure water supply systems, enlightened building codes, and beneficial fire prevention ordinances that reduce industrial hazards. The dangers that accompany the trend to the country should not be overlooked. The fire department in a small town or rural area may not have the men, equipment, or the "know-how" to control fires in huge factories or warehouse buildings. The fire department may be located miles from the plant, and the fire that breaks out could burn for hours before effective fighting forces could be brought to bear upon it.

Never before have so many materials of extreme combustibility been used, stored, or transported on such a grand scale as in the United States today. Tank cars, tank trucks, ships barges, and pipelines convey a wealth of raw materials on which our whole chemical, plastics, rubber, synthetic textile, and many other industries

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[2] Lawrence L. Bethel, Franklin S. Atwater, George H. E. Smith, Harvey A. Stackman, Jr., Industrial Organization and Management (New York: McGraw-Hill Inc., 1950), p. 198.

are based. Many of these materials are gases--almost as toxic as war gases. Some are liquids at low temperatures that become gases at atmospheric temperatures and are more easily ignited than gasoline. Some are stored under extremely high pressures. Many are stored in enormous quantities.

BENEFITS TO BE DERIVED FROM APPLICATION OF NAVAL DAMAGE CONTROL PRINCIPLES

What can industry do to offset these potential hazards? It is admittedly not practical to train every employee to be a fireman--but neither is it practical to abandon the industrial "ship" in the face of impending or actual disaster without taking steps that will minimize damage; nor is it practical to stand by awaiting the arrival of professionals when there is already available a group that with proper training and organization can transform itself into effective Damage Control teams--the employees themselves.

The potential savings to be realized from this approach of applying ship-board Damage Control techniques to industry go well beyond the avoided losses in property which, according to the National Bureau of Fire Underwriters, were 244 million dollars in 1962 for fire alone![3] Indeed, there are other considerations such as the loss of trained and skilled workers who obtain employment elsewhere after a

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[3]Quarterly of the National Fire Protection Association, Vol. 57, No. 2, October 1963 (Boston: 1963).

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

full or partial plant shutdown, the loss of customers who cannot wait for an industry to get back into production, the loss of executive man-power in scheduling, rebuilding, and planning, the loss of competitive position; the list is seemingly endless---

CHAPTER II

A MODEL DISASTER CONTROL PLAN FOR INDUSTRY

Chapter I dealt with Damage Control techniques and organizations aboard U.S. Naval Vessels today. It was also hypothesized in Chapter I that American industry has similar needs for the same type of functional organization, i.e., one that assigns specific responsibilities to individual members of the organization, to cope with those emergencies, which if left uncontrolled long enough, could develop into a major disaster.

It is the purpose of this Chapter to present a model industrial disaster control plan which, in essence, was developed from those techniques heretofore applied primarily by shipboard Damage Control organizations. Various details as to how the plan was developed, implemented, and operated, as well as the results will also be presented. Later Chapters will deal specifically with cost effectiveness studies concerning the involved expenditures.

The model to be presented was developed specifically for the Navy's aircraft Overhaul and Repair Facility located at the U. S. Naval Air Station, Jacksonville, Florida. The specific Instruction which promulgated the plan is set forth in Appendix A.[4]

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[4]NAS JAX)&R Instruction 3440.1A, Subj: Disaster Control Organization; Promulgation of, (Code 860): (Jacksonville Naval Air Station, 20 June 1963).

O & R JACKSONVILLE - AN INDUSTRIAL COMPLEX

O&R Jacksonville comparability to other industry. As a matter of showing comparability to other industries in the United States, O & R Jacksonville occupies about a million square feet of building floor space, employs approximately 3100 civilian workers, overhauls thirteen different types of aircraft, ten different models of aircraft engines, and reworks or overhauls over 9000 end items or aircraft component parts each quarter of the year.

Although the facility has several assembly lines, it is not primarily an assembly-type plant, but rather a job-shop organization, and it is the largest industry in Northeast Florida. The Naval Air Station, under which the O & R functions as a Department, has its own fire department of seventeen units which is charged with the responsibility for providing structural fire protection. The NAS also has a medical department, a dispensary, and a Naval Hospital command, all of which are capable of providing emergency medical services when required.

Within the O & R Department, there is the typical industrial type of fire protection equipment including fire hoses, CO2 bottles, sprinkler systems, foam systems and magnesium extinguishers. There are flame-proof areas for testcell operations and several automatic fire protection systems (CARDOX). In addition, the department has its own dispensary for civilian employees. There is an industrial safety division which contributes to make the organization as safety conscious as any industry in the country.

Prior to plan development, there were station and Departmental fire prevention and fire protection Instructions; there were NAS hurricane security Bills, Department aircraft hurricane evacuation Bills, a station storm Bill; there was every type of regulation required to keep the O & R "safely going on in peace or war." What was truly possessed was many loose ends that needed amalgamation.

WHY THE PLAN WAS DEVELOPED

A Directive from higher authority. As a direct result of the Cuban Crisis of 1962, the Commandant, Sixth Naval District, by revision to previous Instructions, directed NAS Jacksonville to organize, train and equip a minimum number of disaster control teams that would be considered a part of the North Florida Disaster Control Group.[5] This, in effect, required that the Naval Air Station "military" facilities for fire fighting, damage control, medical aid and decontamination be integrated and then redistributed organizationally as "Disaster Control Recovery Teams." The O & R Department, however, was still the largest facility at the station involving the employment of some 3000 workers, none of whom was actively engaged in the civil defense "disaster control" effort. It became the Department's responsibility, therefore, to supplement these NAS Jacksonville Instructions specifically for the O & R Department which, in essence,

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[5] Revision, dated 10 January 1963 to Commandant, Sixth Naval District, Disaster Control Recovery Plan 3-60 (DCRP-6ND); Charleston, ComSix, 1960.

[illegible]

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[illegible]

[illegible]

required that the department "solve its own problems." It was well known that if there was ever a large explosion or a large incident at the base, the military forces that the station could muster would be so limited in numbers as to be ineffective in the O & R Department. O & R top management was therefore keenly interested in a coordinated disaster control effort for the Department.

THE PLAN

Preliminary Planning. It was to become a plan of action; to assess those emergency plans already in existence, evaluate and adapt their better parts into an all-inclusive plan. Also, the support which could be expected from outside sources in the event of an incident would be assessed; and how quickly this support could be made available. A rough plan would then be developed and tested prior to issuance of a final firm plan.

Inspections made. To obtain a more practical grasp of existing conditions concerning the facility itself and worker familiarity with the facility, a number of inspections were made of the shops. During the course of these inspections, a number of startling revelations were witnessed. For example, a number of industrial gas lines (Hydrogen, Helium, Butane, Acetylene, Oxygen) ran through some ten to fifteen shops enroute from storage tanks to the welding shop. These lines were not coded as to their contents as they passed through these non-user shops although some of them had isolation valves at various enroute locations. None of the workers in these non-user

shops was aware of what the line contained, nor were they aware that the spread of volatile gas allowed by a line rupture could be controlled by these valves.

Other facts brought out by the inspections were that no provisions were made for draining and purging volatile solutions from tanks during conditions of emergency. Workers were not thoroughly familiar with recent changes that had been incorporated into the facility, and in general, had an apathetic attitude about civil defense preparedness. No provisions had been made for "immediate" needs concerning emergency shutdown, emergency rescue operations and on-the-scene first aid. It was also determined that the regular members of the station fire department were not thoroughly conversant with some of the inherent dangers associated with some of the more complex equipment within the department.

<u>The Damage Control Survey</u>. As a result of the information obtained in the preliminary inspections, the task of locating and identifying every piece or item of equipment/fixture that could contribute to damage was assigned to the Plant Division Superintendent. The criteria under which he was to proceed was: Could the item, if left uncontrolled, unattended, or unsecured in an emergency, contribute to, or become a further source of damage during an emergency.

Each shop and work area was surveyed piecemeal, identifying each item which met the aforementioned criteria. In most cases, every shop supervisor knew what the described items were supposed to do. However, some of the systems, such as the industrial gases system, which ran

throughout the facility were more nebulous except in the shop where they were used. Although assigned specifically to the Plant Superintendent, the Damage Control survey was a joint effort which included the services of the various shops, division superintendents and shop supervisors. This survey required two months to complete and contained sixty-four pages of material, one page of which is reproduced in Figure 1. From this particular page of the survey, it may be noted that each of the items represented has some degree of volatility, and if left unattended in an emergency, could be the source of further damage or injury. The shops cited in Figure 1 are all in the same building and general proximity of one another.

Objectives Stated: During the time that the Damage Control survey was being conducted, various members of O & R management were assigned the task of developing suitable objectives. After due consideration of the present organization of the Department[6] and the experience of several members of management in shipboard Damage Control organizations, the following objectives were stated and subsequently accepted by top management:

1. Find a method to adequately portray the O & R as it now is, indicating as well as possible those items of equipment which need attention in case of emergency.

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[6] Consult Bureau of Naval Weapons STANDARD ORGANIZATION MANUAL FOR OVERHAUL AND REPAIR ACTIVITIES, Navy Department (Washington: U.S. Government Printing Office, Rev. 1963).

7. Exhaust system control switch on east wall of shop 6214.

Shop 6281-1 (Shop 6252 area):

1. Caustic soda tank. Capacity 40 gallons at 180 degrees F. Steam valve on tank. No drain connected.

2. Sodium cyanide tank. Capacity 30 gallons. No drain connected.

3. Sodium cyanide tank. Capacity 30 gallons. No drain connected.

4. Bronze plating tank. Capacity 80 gallons of cyanide base solution at 180 degrees F. Steam valve on tank. No drain connected.

Shop 6281 (6103 area):

1. Metal spray booth. Four oxygen and seven acetylene bottles used. Also, acetylene and oxygen are piped in from distribution system. Exhaust blower switch on wall near booth.

Shop 6281 (Etching Room):

1. Two carboys of nitric acid and 400-pound drum of caustic soda in area.

2. Room exhaust fan in overhead. Control switch number 11 in power panel number 40 on north wall of shop 6203.

Shop 6281-1:

1. Baking oven. Exhaust fan switch on side of oven.

2. Tin-cadmium plating machine. Exhaust blower control switch on east wall.

a. Tank number 2, approximately 250 gallons of caustic soda at 180 degrees F. Steam valve on tank. No drain connected.

b. Tank number 4, approximately 100 gallons of hydrochloric acid. No drain connected.

c. Tank number 6, approximately 1400 gallons of tin stannate at 175 degrees F. Steam valve on tank. No drain connected.

FIGURE 1

A TYPICAL PAGE FROM THE DAMAGE CONTROL SURVEY CONDUCTED BY THE PLANT DIVISION SUPERINTENDENT (PLANT SURVEY 1962)

d. Tank number 8, approximately 300 gallons of sodium cyanide. No drain connected.

e. Tank number 10, approximately 150 gallons of water at 180 degrees F. No drain connected.

3. Bonderizing tank, approximately 40 gallons of nitric and phosphoric and sodium nitrate. No drain connected.

FIGURE 1

2. Find a way to assign these items of equipment to the individual workers who could control them.

3. Build an organization for disaster control which will resemble as closely as possible the present O & R departmental organization.

4. Combine the active portions of Damage Control with the passive portions, and have measures for emergency rescue.

<u>The Disaster Control Drawing</u>. It was decided that the best way to display the information developed by the survey was to design a drawing which would be representative of a particular area, and be no larger than one could easily comprehend in terms of its usefulness for training. A three-dimensional oblique drawing was conceived whereby both profile and plan representation could be made of the items cited. Figure 2 is a small scale reproduction of one of these drawings (a complete set of drawings covering the entire Department contained eleven prints) the boundaries of which corresponded to the then existing "fire-zone boundaries." After careful consideration of the first objective earlier stated, it was decided that the following information should be placed on all drawings: Zone boundaries, shop layouts, the location of all fire-fighting equipment within and adjacent to the zone, the location of all first-aid lockers and equipment, hurricane gear lockers, Damage Control gear lockers, and the location of all items requiring attention in the event of fire, explosion, flood or other emergency. Careful analysis of Figure 2 should immediately


MEZZANINE
MEZZANINE
EQUIPMENT LEGEND
IED 1 HANGAR DOOR
IED 2 SWINGING DOOR & 2 ROLL-UP DOORS
IED 3 ROLL-UP DOOR
IED 11 SLIDING DOOR & PERSONNEL DOOR
IED 14 EQUIPMENT DOOR
IEV 1 OXYGEN MASTER CUT-OFF VALVE
IEV 2 HYDROGEN MASTER CUT-OFF VALVE
IEV 3 LP GAS BY-PASS VALVE
IEV 4 LP GAS CUT-OFF VALVE
IEV 5 2 LP GAS CUT-OFF VALVES (IN STORAGE AREA)
IEV 6 4 AMMONIA CUT-OFF VALVES
IEV 7 OXYGEN CUT-OFF VALVE
IEV 8 OXYGEN CUT-OFF VALVE
IEV 9 HYDROGEN CUT-OFF VALVE
IEV 10 HYDROGEN CUT-OFF VALVE
IEV 11 LP GAS CUT-OFF VALVE
IEX 1 DAMAGE CONTROL GEAR LOCKER
IEZ 1 HURRICANE GEAR LOCKER
I+2 AREA FIRST AID LOCKER
IE+1 ZONE
IEX 2 RESPIRATOR
IEE 1 POWER SWITCH
IEE 2 POWER PANEL
IEE 3 POWER PANEL & LIGHT PANEL
IEE 5 LIGHT PANEL
IEE 6 POWER PANEL
IEE 7 2 POWER PANELS
IEE 8 POWER PANEL & LIGHT PANEL
IEE 9 POWER PANEL
IEE 10 3 LIGHT PANELS
IEE 11 SWITCH COMPLEX
IEE 13 SWITCH COMPLEX
IEE 16 POWER PANEL
IEE 17 SWITCH & POWER PANEL
IEE 18 SWITCH & 2 POWER PANELS
IEE 19 LIGHT PANEL
IEE 20 POWER PANEL (440 V)
IEE 21 LIGHT PANEL
IEE 24 POWER PANEL
IEE 25 2 SWITCHES
IEE 26 POWER PANEL & 2 SWITCHES
IEE 27 2 POWER PANELS
IEE 28 POWER SWITCH
IEE 29 POWER PANEL
IEE 30 POWER SWITCH
IEE 31 POWER PANEL & LIGHT PANEL
IEE 32 2 LIGHT PANELS & 2 SWITCHES
IEE 33 POWER PANEL
IEE 34 POWER PANEL & SWITCH COMPLEX
IEE 35 LIGHT & POWER COMPLEX
IEE 36 2 POWER SWITCHES
IEE 37 POWER PANEL & SWITCH COMPLEX
IEE 38 LIGHT PANEL
IEE 39 POWER PANEL
IEE 40 LIGHT & POWER COMPLEX
IEE 41 LIGHT PANEL
IEE 42 POWER PANEL
IEE 43 LIGHT PANEL & SWITCH
IET 1 KIRKSITE POTS
IET 2 MOLTEN SALT BATH
IET 3 HEPTANE TANKS IN TEST PANELS
IET 4 UNDERGROUND HEPTANE TANKS
IET 5 KEROSENE TANK IN TEST PANELS
IEW 1 WINDOW CONTROL (1)
IET6 TRICHLORETHYLENE DEGREASER
IET9 MELTING FURNACES (2)
IED18 ROLL-UP DOOR
IEE44 SWITCH FOR OVEN
IEV12 HYDROGEN CUTOFF VALVE
IEV13 OXYGEN CUT-OFF VALVE
IEV14 ACETYLENE CUT-OFF VALVE
IEV16 L.P. GAS CUT-OFF VALVE
IEV18 COLD WATER CUT-OFF VALVE
IEV20 STEAM CUT-OFF VALVE
IED15 SLIDING DOOR
IEW8 WINDOW CONTROL (1)
IEW30 WINDOW (3)
IEZ4 HURRICANE GEAR LOCKER
IBE1 POWER SWITCH
IBE2 POWER PANEL
IBE3 POWER PANEL
IBW1 2 WINDOW CONTROLS
I+1 FIRST AID SUPPLY CABINET
FIRE ALARM BOX NO. 346
AUX. FIRE ALARM BOX
RAMP DOWN
RAMP TO MEZ.
MENS HEAD ON MEZ.
WOMEN'S HEAD ON MEZ.
TEST CELL AREA
HYDROGEN CUT-OFF VALVES
OXYGEN CUT-OFF VALVES
LP GAS STORAGE AREA
AMMONIA STORAGE
HYDROGEN CUT OFF VALVE IEV2
OXYGEN CUT OFF VALVE IEV1
TO LP GAS BY-PASS VALVE IEV3
FIRE ZONE 346 & VICINITY
LEGEND (FIRE)
2 LB. CO_2
15 LB. CO_2
50 LB. CO_2
SPRINKLER SYSTEM
4 LB. CO_2
FIRE BLANKET
40 GAL. FOAM
MAGNESIUM EXTINGUISHER
WATER PUMP
HOSE REEL
DRY POWDER
SODA ACID
40 GAL. SODA ACID
FIRE ZONE BOUNDRY
WINDOW CONTROL
CARDOX CONTROL
BOUNDRY LINE FIRE ZONE No. 346
HANGAR DOORS IED1
DISASTER CONTROL FIRST AID SUPPLIES
NOTE: TO CUT OFF COLD WATER FROM 7282 BOTH IEV18 & IEV19 MUST BE CLOSED.
OVERHAUL & REPAIR DEPT. U. S. NAVAL AIR STATION JACKSONVILLE 12, FLORIDA
DISASTER CONTROL DAMAGE CONTROL DIAGRAM FIRE ZONE No. 346
DRAWN OSTEEN 11 JUN 63
CHECKED HERRN 6-11-63
98547 F PL-0100 F

FIGURE 2.

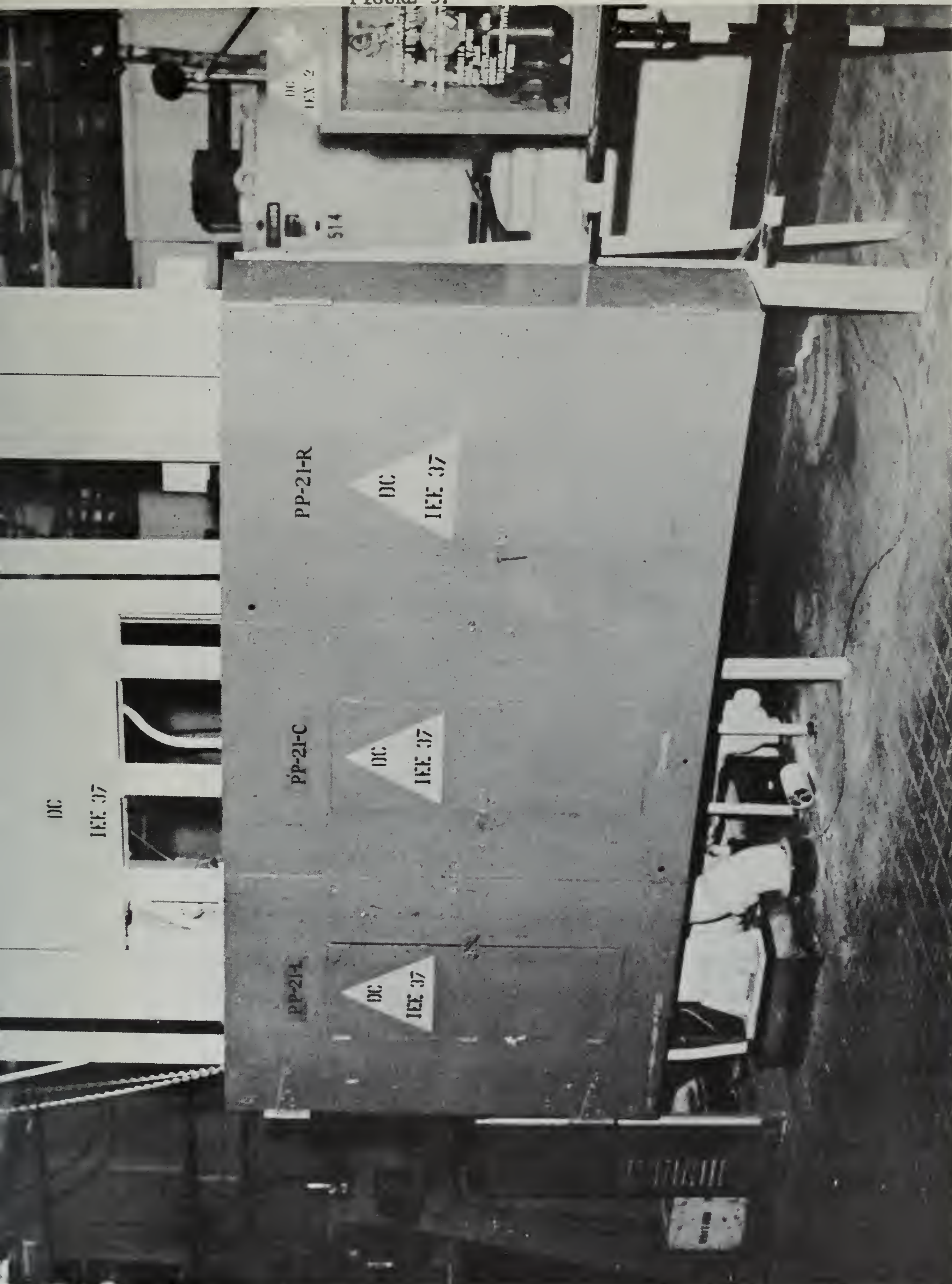
indicate the wealth of information which could be made easily available to the workers for the purpose of training alone. Further analysis of Figure 2 will reveal the coding system developed to portray and identify functions of the various items of equipment.

Noting the right hand side of Figure 2, the first indicator, Roman numeral I, refers to the area. The second indicator, a letter, refers to the zone. In this case, the letter "E" refers to Zone 346. The third indicator is a letter which refers to the type of equipment, the letter "T" stands for tank, "E" for electrical equipment, "V" for valve, "D" for door, etc. (Code contained in the Appendix.) The last indicator refers to a sequence number that the item acquired as it was located on the drawing. (It was further found advantageous to go to the piece of equipment in the shop and place the same code on the item.)

Figure 3 is an actual photograph of several items of equipment labeled according to the Plan requirements. Two distinct categories of equipment can be seen in this figure; the electrical panels are marked with the characteristic yellow triangle and black letters of Civil Defense. Also, an item used for emergency rescue operations (extreme right) can be seen bearing the Damage Control item code.

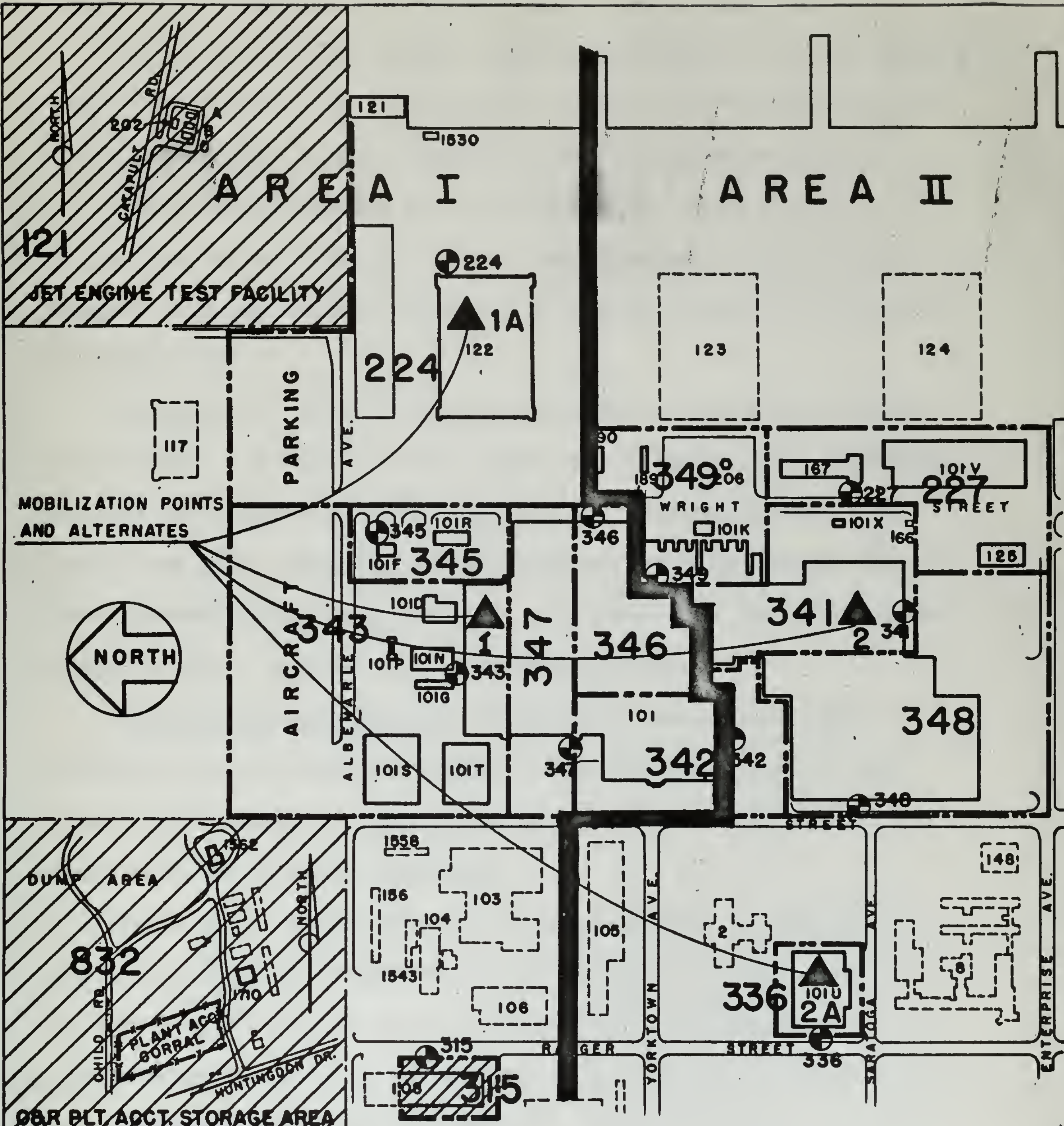
<u>Span of Control and The Area Disaster Control Group</u>. It was also considered desirable that a specific area <u>size</u> be established within which an organization could be formed that would be completely autonomous groups which could function independently. The two areas (Figure 4) represent the **geographical** responsibilities of each of two Area Disaster

FIGURE 3.



Several Items of Equipment Labeled According to Plan Requirements

FIGURE 4.



DISASTER CONTROL AREAS (WITH ZONING)

NOTE: Areas 121, 315, and 832 are not included as part of the Disaster Control Organization. However, these areas will be manned by O&R personnel in case of fire. Personnel manning these zones will report to other departments for coordination in accordance with NASJAXINST 11320.1C.

Control Groups required for the plan to function satisfactorily.

Simply then, each of the two areas is controlled by an Area Disaster Control Coordinator, and assisting him are people responsible for each of the zones within a particular area. The large numbers 348, 341, 342, and so forth, were the various existing fire zones in the O & R at the time the new Disaster Control Plan was drawn. These were not changed. The zone drawing (Figure 2) is actually Zone 346 on the Area Plan (Figure 4).

The people in charge of zones are designated Zone Fire and Hurricane Marshals. Within each zone, there are the various shop supervisors who will be responsible to the Zone Fire and Hurricane Marshal, and within each shop, there will be fire fighting teams and Damage Control teams responsible to the supervisor. This sets forth the basic concept involving span of control entailed within the Plan.

The Zone Team organization. Although the entire departmental organization can be found in Appendix A, it will be relevant at this point to look closely at some of the organizational relationships, considering the functions performed.

Figure 5 is a caricature representation of the Zone Team Organization (Zone Fire and Hurricane Marshal and below). Looking first at the center of the Figure, one will notice the shop supervisor, and the indication of his control over elements of his shop fire bill (Figure 6) and shop Damage Control bill (Figure 7). The shop fire bill is a document posted in each shop which recognizes the fire equipment within and

FIGURE 5.

ZONE TEAM ORGANIZATION

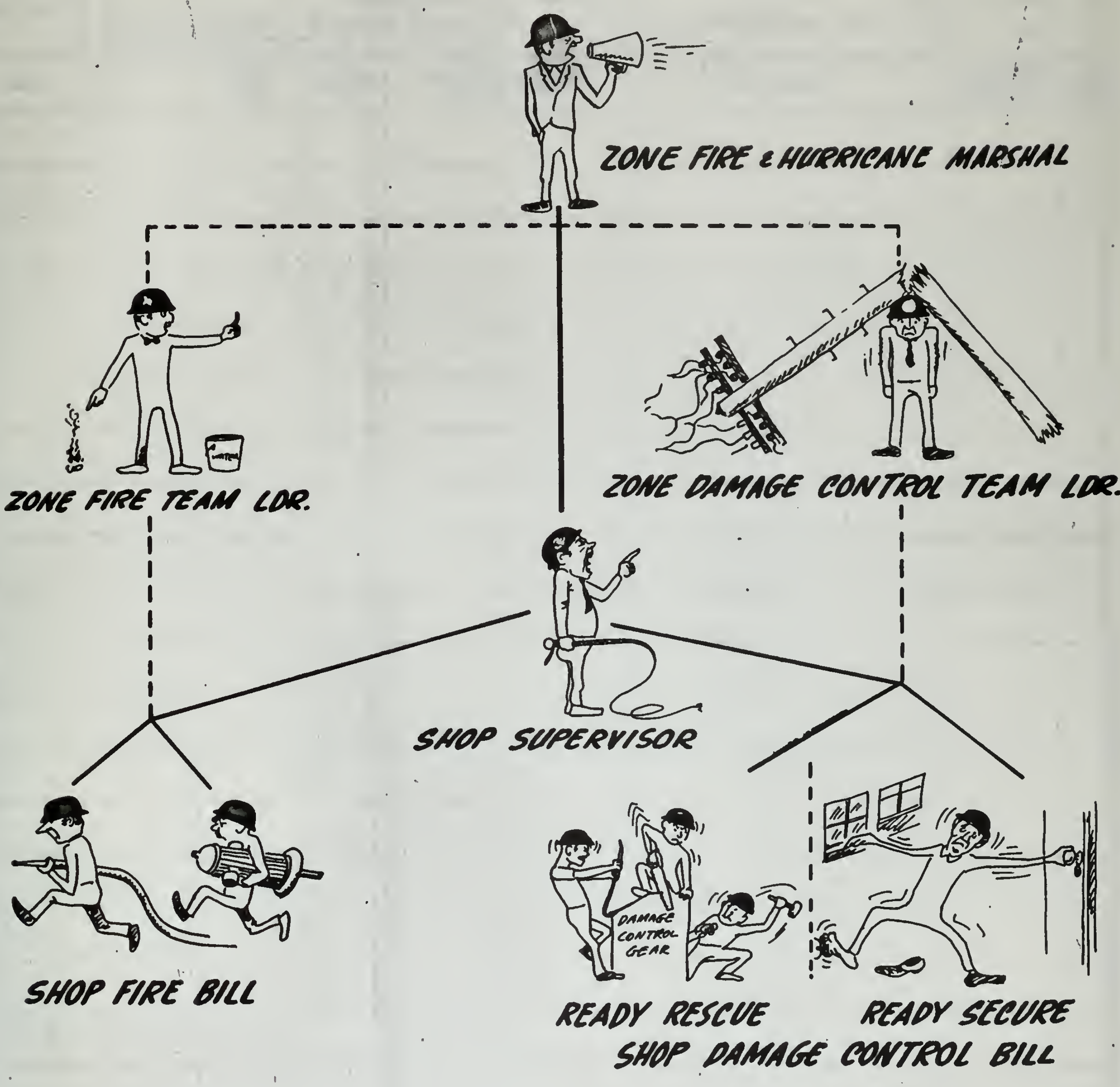


FIGURE 7.

DISASTER/DAMAGE CONTROL BILL
6ND NAS JAX 3440/3 (2-63)

DISASTER CONTROL AREA	ZONE	DATE

D.C. TEAM LEADER (Phone Ext.)	ALTERNATE (Phone Ext.)

MEMBERS	POSITION	SHOP	SHOP EXT.	HOME PHONE	TRAINING INFO.

EQUIPMENT/FACILITY	LOCATION	ACTION REQUIRED	PERSON ASSIGNED	ALERT CONDITION REQUIRING ACTION

REMARKS:

adjacent to the shop, including a necessary amount of overlap to allow for all contingencies. The bill also indicates the names of persons responsible for handling this equipment. Furthermore, it reflects assignments for all working shifts and included alternates.

The Damage Control bill (indicated by figures on the right side of Figure 5) is broken into two parts; one part pertains to the security of equipment, the other part involves the rescue of personnel as one example of active Damage Control practice.

The Damage Control bill and the fire bill (collectively known as disaster control bills) are the lowest level of responsibility assignment. The bills indicate the individual workers in the shops by name, the item for which they are responsible, and under what conditions of alarm they will take certain action. The Damage control bills also contain items of equipment which are not in the specific shop, but which can be of assistance in event of emergency. For example: The Hydrogen line valve which can be operated from a remote location if necessary.

Departmental Organization. Figure 8 is similar to Figure 5, except that it represents the Disaster Control organization above the level of the zone.

Recalling from Figure 4 that there are eleven zones in the O & R complex under two major area divisions, one finds a similar notation at the bottom of Figure 8; five zones in Area I and six zones in Area II. The Area Coordinators who report directly to the departmental Disaster Control Officer each have available for their use a group of three

DEPARTMENTAL ORGANIZATION

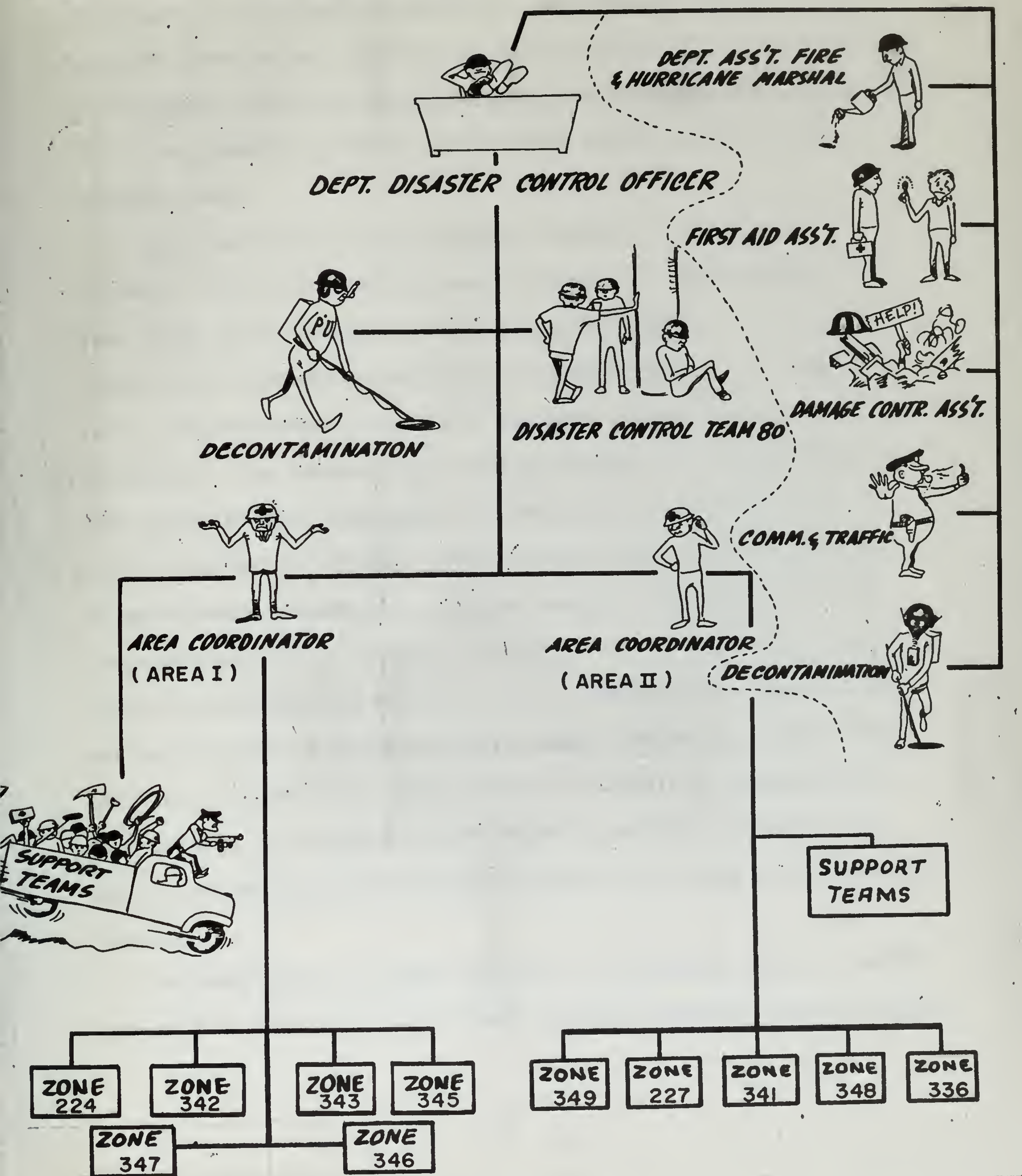


FIGURE 8

support teams: 1) a Communication and Traffic Team, 2) a First-Aid Team, and 3) an Emergency Rescue Team. Each Area Coordinator, along with his three support teams and his five (or six) Zone Fire and Hurricane Marshals with their respective zone team organizations is considered to be a completely autonomous Area Disaster Control Group for his respective area.

There are several other functional elements of importance in Figure 8. There was a possible need foreseen for a Decontamination Team in the event of nuclear attack or nuclear incident (a radiation hazard caused through the handling of nuclear weapons). The Decontamination Team was staffed by military personnel assigned to the O & R Department. They received their training outside of the Department and also fulfilled other requirements of the basic NAS Instruction for disaster control as a station Decontamination Team. This small group of people could perform any monitoring necessary in either of the two areas in the event of a radiation hazard. (It is recognized that many industrial organizations would not feel it worthwhile to consider this particular aspect of disaster control unless located in a prime target area. On the other hand, some education of workers in decontamination procedures is of considerable assistance in combating fatalistic attitudes about the ability to survive and fight back in the event of nuclear attack.)

The small group of people referred to as "Disaster Control Team 80" (Figure 8) is composed of those plant services personnel normally employed

during non-operating hours. These people were given the necessary training required to assume the disaster control function on a limited scale during non-working hours.

Top Management control and planning. The Assistant Department Head was appointed as the departmental Disaster Control Officer with the Production Manager as his alternate.[7] The five staff assistants were appointed from those officers who had regular billets most closely associated with the responsibilities assigned by the Plan. For example, the departmental Fire and Hurricane Marshal was the Shops Division Officer; his alternate was the Shops Group Superintendent. The First-Aid Assistant was the departmental Administrative Officer, and his alternate was the Administrative Group Superintendent. The Damage Control Assistant was the Production Engineering Officer; his alternate, the Production Engineering Superintendent. The Communications and Traffic Assistant was the Production Planning Officer, and his assistant was the Dispatch Division Superintendent. Although the Aircraft Transfer Officer was not in the hierarchy from which the other Staff Assistants were drawn, he was the Division Officer for the military enlisted personnel of the Department, and therefore appointed as the O & R Decontamination Assistant. In every way possible, the existing organization of the Department was preserved in organizing for Disaster Control.

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[7] Ibid., BUWEPS Standard Organization Manual.

[8] Ibid.

Responsibilities assigned. Responsibilities specifically assigned to all members who were a part of the Disaster Control organization concerning organizing, training, and functional control may be found in Appendix A.

Organization boards. One of the principal problems encountered during development of the Plan was determining how best to display information and provide a vehicle for individual workers to keep themselves informed about their specific responsibilities. To do this, a number of "Organization Boards" were designed and constructed, later to be located in strategic areas and zones throughout the Industrial Complex. Figure 9 is a photograph of one of the Boards (located in Zone 227 of Area I). One of these boards is required in each zone and at each Area Mobilization Point; on them appear the names of all key team leaders in that particular zone. There are also places for the disassembled basic instruction (Appendix A) to be attached for quick reference. Prominent placement and ready access has improved their usefulness as training devices. A Disaster Control drawing (like Figure 2) is located in a frame adjacent to each organization board so that it also can be used for training purposes.

Implementation and shift-over to the new system. After preliminary plans were formulated concerning the basic organization, and after construction of the first Disaster Control drawing, a period of training (about six weeks) took place, during which time every worker with an assigned responsibility within one particular zone was trained and drilled

FIGURE 9.

Disaster Control Orgqnization Board

at his function. The Fire and Damage Control Team Leaders, along with the Zone Fire and Hurricane Marshal of this one zone and his respective Area Coordinator also underwent systematic and organized training. The Support teams for this one area were equipped and drilled as to their functions and responsibilities in relation to this one zone. After all training was completed, an administrative-operational inspection was carried out (Inspection Form appears as Enclosure 7 to Appendix A.).

After the inspection and drills were completed, several members of management (Staff Assistants, Disaster Control Officer, Area Coordinator, the particular Zone Fire and Hurricane Marshal) all met and critiqued the drill. When it was determined that the zone was properly prepared for the responsibilities involved, it was brought under the new system. Furthermore, the basic Instruction was not published until the plan had been implemented in one zone (346).

IMPLEMENTING AND OPERATING COSTS

Implementing costs. Table I represents a cost breakdown of those items required to implement the Plan at O & R Jacksonville.[9] Although some costs are estimates, they represent reasonable cost conclusions based on man-hours away from the normal course of work. A twenty percent overlap contingency was deducted from total costs to allow for

[9] Cost information obtained from Plant Engineering records of 1963 (G. J. Arnold letter to Production Engineering Officer, O & R, May 1963).

TABLE I

O & R JACKSONVILLE DISASTER CONTROL

ITEM COST INFORMATION

Planning and Service Costs are estimates based on stated criteria. Construction and equipment costs were as charged to the Job Number (MAINT JOB COST ALLOTMENT # 0033485, O & R, 1963).

Planning:*		
Top Management:		
(includes time spent at five meetings by ten members of O & R Management, average grade GS-12)		$ 300.00
Departmental:		
(includes time spent over six weeks period one half-hour per day, 150 persons throughout eleven Zones @$2.00/hour)		2250.00
Drafting Service:		
(One Draftsman, full-time)(twenty weeks)		2000.00
Plant Construction:		
20 Damage Control Gear Lockers	$200	
17 Hurricane Gear Lockers	170	
15 Organization Boards	75	
23 Frames (for DC Drawings)	115	
2 Emergency Rescue Mobile Carts	500	1060.00
Equipment:		
Helmets	$ 600	
Damage Control Support Equipment	1000	
Hurricane Securing Equipment	750	
First-Aid Equipment	1500	3850.00
Training:		
(Estimated at 1000 hours on the job, prior to first drill)		4884.00
First Drill:		
(Charged as time off the job, eleven zones, 600 workers, 15 minutes off, $2.00/hour)		300.00
TOTAL COST OF IMPLEMENTATION		$14644.00

TABLE I

(continued)

LESS: 20% overlap contingency for equipment items and training which would be required under any other plan under present use.	2928.00
TOTAL EFFECTIVE COST TO IMPLEMENT	$11,716.00

* 20% of Planning Cost are considered adaptation cost, the remaining 80% of Cost refer to Model Development.

those costs which would have accrued in any event. For example, hurricane security costs would have continued regardless of whether or not the Plan was put into effect; fire drills would have been held regardless of what other plans may have been developed. Plant construction and equipment costs were actual costs attributed directly to planning for Disaster Control. It may therefore be concluded from the information shown in Table I that the costs to implement the Disaster Control Plan for eleven zones at O & R Jacksonville was slightly more than $11,000.

Operating costs. Assuming total implementation of the Plan, operating costs would be based on the following: Periodic drills, periodic replacement of equipment, periodic retraining of workers and maintenance of condition readiness. Owing to the newness of the Plan, and the fact that no operating costs other than drills had been generated, it was decided to place operating costs at five percent of implementing cost each month until major cost items dictated otherwise; thus, monthly operating costs were placed at less than $500.

Reduction of operating costs as a direct result of the Plan. One day during the development of the overall Plan, there was an automatic fire alarm activated in Zone 346, the sounding of which caused approximately 600 workers to evacuate the zone after closing certain windows. (This was prescribed procedure at that time.) The fire department answered the call and spent well over an hour determining that this alarm had been false. A number of critical sources had to be investigated as possible cause for the alarm. When the "all clear" was

sounded, the cost of this false alarm to the Department in terms of productive hours, was assessed at $25,000 **in direct labor alone.** As a result of this particular incident, those involved in the departmental planning posed the question: "If a shop supervisor had a fire in his shop, would he not certainly know it? Why then could not the shop supervisor be responsible for actually securing his particular shop and notifying the Zone Organization Point? Conversely, if a fire alarm was sounded, and there was no indication of a fire, assuming no further word was received from outside sources, why not allow the shop to continue work"? Based on this reasoning, the shop supervisor was granted the authority (see Page 9, Appendix A) to control his own men based on his judgment and estimate of the situation at hand. The granting of this authority means in effect: When an alarm is sounded, personnel assigned to the zone in question will man their fire stations. Everyone else in the zone will become alert, but will remain at their jobs unless directed otherwise by the shop supervisor or higher authority. (A review of records indicated that 2.5 alarms per month, automatic or otherwise, were sounded within the department. Of this average, 2/month were assessed as false; the remainder, or 1 every 2 months represented genuine fires of varying magnitudes of severity. Although 2 alarms per month were assessed as false, they required that great numbers of workers leave their work for periods of time varying from 5 minutes to more than 1 hour. As a result of the new procedure of allowing the shop supervisor to secure his shop, rather than having it happen "automatically," the resulting per month

savings acc[illegible]d by keeping workers on the job through those false al[illegible], was assessed at $3000/month.) Needless to say, this method of operation has paid for itself many times through the savings accrued when alarms occur. Other sources of savings will be pointed out in the next section.

OPERATING RESULTS

O & R Top Management reviews one year of operation under the Plan. The Plan, as described, was implemented in the first of eleven zones in January, 1963. By May of that same year, all eleven zones of the O & R Complex were functioning under the Plan. As a result of inquiries concerning the operation of the Plan, the Overhaul and Repair Officer in December, 1963, provided the following:[10]

> There has been an improvement in worker morale and acceptance that is difficult to measure in concrete terms. Perhaps, it is an unconscious recognition that they can do something to protect their jobs as well as a feeling of greater personal security in the performance of their work. Since implementation of the program, our lost time accidents rate has been reduced from 719 last year to 16 man-days for the same period this year. I recognize that these figures could also be attributed to our safety program; however, the latter program was conducted at approximately the same level of effort during the two periods.
>
> There has accrued some indirect benefit through local publicity in the newspapers and recognition of O & R trained employees who took the proper emergency actions when present at automobile accidents outside of normal working hours.

[10] R. H. Fagan, personal letter to Frederick G. Fryberger, Plant Engineer, Chemicals and Plastics Division, FMC Corporation, Baltimore, Maryland, 17 December 1963. (Permission contained within to quote.)

Two unscheduled events have occurred in the past few months that provide an inkling to the effectiveness of the program. In one case, a building contractor employee during the modification of an engine test cell, erroneously cut through a 70 psi. oxygen supply line (after the proper inert pipe line had been pointed out to him and marked) with an acetylene torch. The resulting explosion ruptured an adjacent hydrogen line, and we had a fire of major proportions in the making. The contractor employee was burned and injured when knocked from the scaffolding by the explosion. The Local Disaster Control Team went into immediate action by securing the industrial gas lines in the area, dumping the pressure in the lines and bringing the fire under control prior to the arrival of the fire department vehicles which are located approximately three blocks away. In the meantime, the area first-aid team went into action with the injured contractor employee and had him on a stretcher on the way to the dispensary by the time the ambulance arrived with the fire trucks. Damage and injury were minimized by the training and prompt action of the employees involved.

The second unscheduled event occurred when Hurricane Flora took up a course for Jacksonville on October 14th, and we were directed to button up our activity and hangar all aircraft. The last time the Jacksonville area had been threatened by a hurricane had required about five to six hours to secure the O & R. This time we were able to secure all areas in two hours that evening (and incidentally, we were in full operation within one hour after the threat of the hurricane was over the next morning). The minimization of our shut-down time in this case was definitely attributable to the planning and training resulting from our Disaster Control organization.

Both of the above events have provided emphasis and confidence in our Plan and an assurance that the cost and effort of implementation is justified in our environment.

Results of drills conducted. As a result of regularly scheduled drills, the following items were noted:[11] 1) Need for further training and indoctrination of employee duties and actions in emergency areas. 2) Improvement in communications both locally and to higher management

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[11] *Ibid*.

during the confusion which results. 3) Need for assistants to help firemen with hose-laying. 4) Clearing access routes and aisles of carts, dollies, tractor trains, and forklifts. 5) First-aid teams in all cases have performed perfectly, providing the correct actions and procedures well in advance of arrival of station ambulance.

SUMMARY

This Chapter has presented a model Disaster Control Plan which was developed from those techniques heretofore applied primarily to shipboard Damage Control organizations. The specific plan was developed for the Navy's aircraft Overhaul and Repair Facility located at the U. S. Naval Air Station, Jacksonville, Florida, and appears in this paper as Appendix A. There was a comparison drawn between O & R Jacksonville and other industries in the United States. The reasons for development were also pointed out. The Plan itself was then presented indicating the planning required, inspections made, and the Damage Control survey conducted to establish a beginning point from which to operate. Examples of the survey items are noted in Figure 1. Objectives of the Plan were then set forth, along with specific items required by the Plan, such as the "key" tool of the Plan, the Disaster Control drawing. The organization required by the Plan was then explained including the manner in which the organization was staffed so as to take advantage of the existing O & R organization. The method of shift-over from the old method of handling emergencies to the new

was then described. Implementing and operating costs were discussed (Table I) as well as necessary assumptions.

A specific example of operating costs being reduced as a direct result of the Plan was offered, indicating that similar savings could be obtained in any comparable industry. The final section dealt with the results obtained so far in approximately one year of operation.

The Chapters to follow will deal with the idea of applying similar plans to other industries, and to show not only potential benefit from the safety aspect, but also from the cost reduction aspect.

CHAPTER III

A COMPARABLE PLAN FOR AMERICAN INDUSTRY?

CONSIDERATION OF EFFECT UPON INSURANCE RATES

It will be recalled from Chapter I that a partial answer to the question as to whether or not Naval Damage Control principles have any value in application to American industry was provided through consideration of certain significant trends in industry itself; principal among which were increased plant size, industry migration to less densely populated (and correspondingly less well-protected) areas, and increased use of volatile raw materials.

Statistical evidence to support this thesis of applicability will be presented in the following Chapter; it is considered appropriate at this point to present a non-statistical consensus of the thesis, and more specifically, the model plan discussed in Chapter II by experienced raters of insurance risks.

Inasmuch as the dollar loss from fires occurring annually in this country is in a marked upward trend,[12] it was considered that an integrated working plan of disaster control designed to minimize the "domino effect" in the spread of a disaster from the point of incidence

[12] Report of the Committee on Statistics and Origin of Losses, National Board of Fire Underwriters (New York, 23 May 1963). Table I, p. 5.

would have a favorable effect upon the fire insurance risk grading process of those companies adopting the model to their own use. In order to verify the correctness of this belief, the writers met in San Francisco with representatives of three organizations directly involved in fire risk grading or insurance underwriting: The National Board of Fire Underwriters, the Pacific Fire Underwriters' Bureau, and the Factory Insurance Association.

NATIONAL BOARD OF FIRE UNDERWRITERS AND FIRE INSPECTION AND RATING BUREAU RATING PROCEDURES

The National Board of Fire Underwriters is an organization maintained and supported by some two hundred stock fire insurance companies that provides technical engineering, research, and statistical coordination to local Fire Inspection and Rating Bureaus. The local Bureaus are similarly maintained by fire underwriters, and they are licensed as a service organization by the states in which they operate.

Whereas the NBFU rates public fire protection services within a geographical area (response time for the local Fire Department, location of fire hydrants, traffic congestion, etc.), the local FIRB provides an independent and unbiased appraisal of insurable plants, and grades these industries as to degree of fire risk. They also establish schedules for the use and guidance of fire underwriters to determine independently the degree of risk involved in writing any particular policy of insurance.

National Board Protection Grades. National Board protection grades

run from NB 10 (no protection) in reverse numerical order to NB 1 (best protection). Well trained and fully equipped city Fire Departments such as exist in San Francisco allow the ratings for areas within the city limits to be set at or near NB 2. Protection grades for individual plants located within the geographical boundaries to which the favorable NB grade applies are reflected in the insurance rates applicable to that industry.

Rating Bureau Criteria.. However, it should be noted that the NB area rating serves only as a starting point for individual plant rate determination. Independent fire underwriters can avail themselves either of the professional services of the FIRB in a principal-agent relationship or of the FIRB rating guide lines to determine facility deficiencies which would increase the degree of risk, thereby increasing the insurance rates. This method of grading applies when the company is totally dependent upon public protection, in which case the major categories of deficiency are lack of good housekeeping within the boundaries of the plant, and the nature of bordering hazards.

The rating bureaus also establish schedules for grading a risk which provides its own private protection or utilizes a combination of private and public protection. In this arrangement, grading is established in NB terms, but complete analysis of the plant is made with regard to the following factors:[13]

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[13] Schedule for Grading Protection Facilities, Pacific Fire Rating Bureau (San Francisco: Pacific Fire Rating Bureau, 1963).

A. Water System
   1. Adequacy of water supplies and distribution system
   2. Reliability of water supply
   3. Fire Mains

B. Fire Departments
   1. Manpower
   2. Hose Capacity
   3. General Organization and Equipment

C. Fire Alarm Systems
   1. General - Test, Maintenance, Location and Generators
   2. Equipment

D. Divergence - Penalty charges are determined by the "spread" existing between the Charges for A. (Water System) and the sum of the points charges for B. (Fire Departments) and C. (Fire Alarm Systems).

E. Structural
   1. Application - Building construction, storage yards, sprinkler systems.
   2. Height
   3. Area
   4. Congestion

F. Fire Prevention
   1. Housekeeping and use or storage of hazardous material
   2. Welding practices

Deficiency points determined against the above factors in accordance with the rating bureau schedule are convertible to NB protection grades. These grades are then used in the same manner as those derived for facilities completely dependent on public fire protection for the determination of insurance rates.

APPRAISAL OF THE PLAN BY NBFU, PFUB, AND FIA REPRESENTATIVES. The model plan of Chapter II was presented to these organizations along with a request for a frank appraisal of the potential value to any single company of implementation. In other words, within the framework of the

rating process just discussed, <u>do Naval Damage Control principles have any application to American industry</u>?

The question, not unlike many others that continually confront American industry, cannot be answered with a categorical and universal "yes" or "no." Rather, the answer must be conditioned by the unique environment of each company considering adoption.

However, the consensus is that there are at least three possible results stemming from differing industrial circumstances:

A. Organizations whose facilities were located within the geographical boundaries of cities that were rated by the National Board of Fire Underwriters with a favorable rating such as NB 2 or NB 3 would derive a very minimum to no reduction whatever in fire insurance rates. For example, a company with a factory or warehouse located in San Francisco (NB 2) would derive no more "credits" from the disaster control plan than it could from simply exhibiting good-housekeeping within the facility. In any case, its rating could not be computed more favorably than the city in which it was located.

B. In the event that the company was located within the boundaries of a city that had an unfavorable NB rating, such as NB 7 or NB 8, incorporation of the plan could contribute greatly toward achieving a one or two point reduction.

C. Where companies are located in rural or remote areas that lack adequate fire fighting forces and equipment, it is incumbent on management to provide their own protection. It has been the

general observation of San Francisco area raters that most responsible managements have acquired at least minimum amounts of private protection in the form of equipment and organization.

Nonetheless, the raters observed that benefits to American industry by widespread plan implementation could be realized--if not by immediate reductions in insurance rates made possible by organizing and training beforehand for disaster, then certainly by improvement of the loss rate as a result of fire which in turn would be reflected in a reduction of rates. Of special concern to the NBFU rating personnel is their observation that the indirect losses not directly ascribable to a disaster (loss of orders, loss of skilled personnel who seek employment elsewhere, firm competitive position within an industry, etc.) will run on an average five times the actual cost of fire damage itself.[14]

Development of a Survey. Encouraged by this qualified, yet favorable expression of opinion, and the low installation and operating costs of the model plan at O & R Jacksonville, the writers next developed a questionnaire for completion and return by a randomly selected number of companies.

The objectives of the survey were to:

1. Ascertain the degree to which the surveyed companies had organized their employees into disaster control teams along the lines

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[14] Interview with Office Manager, Pacific Fire Rating Bureau, San Francisco, California on 27 December 1963.

of the O & R Jacksonville model plan. It was anticipated that the responses would support the contention that although American industry spends considerable amounts of money for fire protection, first-aid facilities, special fireproof structures, and industrial safety devices, there is, in general, lacking a program which pre-assigns specific responsibilities to employees within the limits of their capabilities which could reduce significantly the extent of damage once an emergency situation occurred. Furthermore, that the worker with the greatest knowledge of how to handle an emergency situation becomes a completely passive spectator because there is no plan to draw upon his superior knowledge in controlling damage.

2. Ascertain the physical similarities of the surveyed company to O & R Jacksonville before implementation of the plan insofar as size, investment, number of employees, availability of fire equipment, and existent safety programs were concerned. Here the intention was to acquire data that would support the belief that many companies are <u>presently</u> organized and equipped so as to facilitate an easy transition to the organizational concepts of the model plan. In other words, there is already on hand the fire and safety equipment, the personnel, and the line organization for development of an effective disaster control program; the lack involves the existence of an overall scheme to tie these loose ends together.

Pursuant to these objectives, a series of questions (refer to Appendix B) designed to produce the desired data was assembled into a

questionnaire. For example, Question 3, Size of Company, contains a series of sub-questions, which if answered completely, provide sufficient data to establish the physical size of the responding company, and to rank it with respect to other companies, and to O & R Jacksonville.

Answers to Question 5, Georgraphical Location, and Question 7, External Services, provide data to establish the extent of public protection and available outside assistance upon occurrence of a disaster.

Question 6, Safety Programs, was intended to determine the extent of organization among the sampled companies that included:

A. the conventional programs of safety and fire prevention

B. a disaster control program

C. employee participation in organized programs

D. first-aid, medical, and fire protection facilities.

An additional purpose of this question was to provide data by which management attitudes toward the various programs might be ascertained.

Question 8, Statistics, was provided to give the respondents an opportunity to elaborate on any significant trends in the areas of industrial safety and fire prevention within their own organizations that they considered to be attributable to programs in being.

Distribution of the Survey. The selection of companies to receive the questionnaire is a process best described as a "practical-random" approach. While there was conscious effort made to ensure distribution through a wide cross section of industries, there was no attempt to

insert bias in the selection of a company within the industry. Nor were any constraints of company size imposed upon the selection process. The need for the management of the fifty employee machine job-shop to organize their operation so as to minimize damage to facilities and/or injuries to personnel is considered to be of equal relative importance as compared to a similar need of the fifty thousand employee industrial complex.

The actual distribution was accomplished for fifty questionnaires via a Plant Engineering and Maintenance Conference convened at Cleveland in January 1964. The remaining 150 questionnaires were forwarded through the mails during the same period.

SUMMARY

Chapter III has centered around developing a method to determine whether or not an application of Naval Damage Control principles of organization can be of significant value in reducing operating costs for American industry. An expression of reaction of fire rating bureau representatives upon presentation of the model plan was sought, and the consensus was that while widespread adoption would probably not produce an immediate decline of any size in insurance rates, there would be an improvement in the loss rate as a result of fire with a subsequent reduction of rates.

The formulation of survey objectives was discussed, followed by an examination of the questionnaire form with comments on the

expectations regarding responses to it. Finally, explanation was made of the survey company selection process describing the attempt to cover a wide cross section of American industry.

CHAPTER IV

ASSESSMENT OF MODEL PLAN APPLICABILITY

Thus far, this paper has dealt with the development of a model plan for disaster control based upon concepts of employee preparation and participation. Additionally, it has dealt with the origination and distribution of a questionnaire to ascertain the degree of similar industrial organization as well as the types and quantities of First-Aid, medical and fire protection equipment on hand in a representative cross section of American industry.

In furtherance of the attempt to demonstrate the possibilities for widespread application of Naval Damage Control techniques to industry, it shall be the purpose of this Chapter to:

1) present the compiled results (Tables II-VI) of the survey (Appendix B) in support of the premises that a), an unnecessarily high percentage of firms are operating without an overall plan to coordinate employee efforts to minimize damage in the event of fire, explosion, or other similar events, and b), that plan implementation would not require substantial expenditures by individual firms to provide necessary equipment.

2) develop a cost equation for use in computation of plan implementation costs within the individual firm for comparison with average costs of fires to various industries.

3) present a method of approach, involving Simulation techniques for individual firm assessment of the potential value of plan

installation in addition to the benefit derived by reduction of actual physical plant losses.

Compilation of Survey Results. From the distribution of two hundred questionnaires (described in Chapter III), 45 replies were received. Of this number, 34 companies forwarded complete or partial information, while the remaining 11 provided no data, giving various reasons, principal among which were:

1) Security classification of the company's operations.

2) Unwillingness to disclose "proprietary" information.

3) Lack of company records from which to obtain the data.

4) Lack of time or staff to assemble requested data. (This was the reason most frequently given.)

The type of industrial operation represented by the 34 respondents providing data is as follows:

Industrial Operation	# Firms
Food Processing	4
Electronics	8
Chemical-Petroleum	7
Research and Development	2
Automotive	3
Machining	3
Aircraft	1
Communications	1
Explosives Manufacture	1

Industrial Operation	# Firms
Shipbuilding	1
Equipment Manufacture	1
Mining	1
Educational	1

Examination of the following tabulated responses to Question 3 will assist the reader in classification of the respondent companies as to physical size. From 3b., it will be noted that approximately half of the firms are larger than O & R Jacksonville in terms of working area (1,000,000 sq. ft.) while the remaining half are equal in size or smaller. Further, it can be seen in 3d. that O & R Jacksonville, with 3100 employees, lies almost exactly midpoint in the range of number of employees for each responding firm. (As an editorial aside, the writers hasten to add that the midpoint relative positions of O & R Jacksonville can be explained only as "statistical fortuities.")

TABLE II

Size of Company

a. No. of Buildings

1-5	23.6%
6-10	5.9%
11-15	8.8%
16-20	11.8%
20+	44.2%
No answer	5.9%
	100.2%

b. Production Floor Space, SqFt.

Less than 50,000	2.9%
50-100,000	5.9%
101-150,000	11.8%
151-200,000	8.8%
201-500,000	11.8%
*501-500,000	5.9%
1,001-2,500,000	17.7%
2,500,000+	26.5%
No answer	8.8%
	100.1%

c. Estimated Capital Investment

less than $2 Million	2.9%
2-10 Million	5.9%
11-25 Million	11.8%
26-50 Million	11.8%
51-100 Million	11.8%
101-500 Million	8.8%
500+ Million	8.8%
No answer	38.3%
	100.1%

d. No. of Employees

0-100	0%
101-500	11.8%
501-1,000	11.8%
1,001-2,500	20.6%
*2,501-5,000	14.7%
5,001-10,000	5.9%
10,000+	23.6%
No answer	11.8%
	100.1%

e. No. of Shifts

1	20.6%
2	11.8%
3	64.7%
No answer	2.9%
	100.0%

f. No. Hrs./Shift/Week

37.5	2.9%
40.0	85.4%
42.0	2.9%
48.0	2.9%
56.0	2.9%
No answer	2.9%
	99.9%

* O & R Jacksonville position relative to industrial sample

TABLE II

(continued)

G. Government Business % of Total

0-10%	35.3%
11-25%	8.8%
26-50%	2.9%
50-100%	29.4%
No answer	23.6%
	100.0%

76.5% of the companies are located within the corporate limits of a city (Question 5), 14.7% are located outside city limits, and 8.8% have facilities in both areas. Approximately 50% of the companies indicated that their geographical location required special consideration for the occurrence of floods, hurricanes, tornados, and earthquakes, and the accompanying necessity to establish procedures to protect against or minimize losses from these contingencies. However, a determination, based upon the answers to Question 5b., as to whether the companies who recognized the existence of a special problem were, in fact, doing anything about it was inconclusive. It is suspected that the vague and generalized wording of the question itself contributed to this result.

The answers received to Question 6 lend considerable weight to one of the two major premises mentioned earlier, i.e., that many firms are operating without benefit of a plan to coordinate their activities in event of emergency. For example, in response to 6a. only 29.4% of the companies reported the existence of a centralized disaster control program. An examination of the descriptions for other Safety Programs (First-Aid, Industrial Safety, Fire Prevention, etc.) revealed in varying degrees the duplication of the situation that existed at O & R Jacksonville before May, 1964--a number of loose ends in serious need of being tied together.

94.1% reported (Question 6c.) that instructions and procedures are promulgated for the programs that are conducted. The same

percentage reported (Question 6d.) that drills and other instructional programs are being conducted; however, there was a wide range of emphasis indicated by the frequency (6d.(1)) and degree of realism (6d.(2)) provided in the practice.

Frequency of Drills	% of Companies
1 hour/month	38.3%
1 hour/quarter	14.7%
Semiannually	8.8%
Occasionally	14.7%*
No answered	23.6%
	100.1%

* Includes those companies that schedule drills less frequently than Semiannually and/or those companies whose answers indicated lack of any schedule.

Simulation of Drills	% of Companies
Simulated (supported	5.9%
Simulated (unsupported)	50.0%*
Not simulated	17.5%
Not answered	26.5%
	100.1%

* Two categories of "Simulated" are used to differentiate between two categories of affirmative response to Question 6d.(2). Simulated (supported) contained, in addition to an affirmative answer to the question, supporting material indicating considerable detail planning to provide realism during drills.

The answers received to Questions 6f. and 6g. would appear to bear out the second of the two major premises: Plan implementation would not require large expenditures by individual firms to provide necessary additional equipment for the use of disaster control teams. The majority of the respondent companies, and by extension, American industry in general, already have on hand substantial First-Aid, Medical,

and Fire Protection facilities and equipment.

TABLE III

6f. Extent of First Aid, Medical Facilities

No Provisions	2.9%	
First Aid Chests or Lockers	5.9%	
Dispensaries and 2	11.8%	
Nurse(s) on Duty, 2 and 3	11.8%	(available at least one shift)
Doctors on Duty, 2, 3, and 4	55.9%	(available at least part of one shift)
3, 4, and 5	11.7%	
	100.0%	

6g. Fire Protection Equipment Available

CO_2 or Chemical Extinguishers	2.9%
Sprinkler System and 1	11.8%
Fire Hose Reels, 1 and 2	23.6%
Fire Truck(s), 1, 2, and 3	11.8%
Full time Company Fire Department, 1, 2, 3 and 4	38.3%
1 and 3 only	5.9%
1, 2, and 4 only	5.9%
	100.2%

TABLE IV

For Question 7a., community-provided medical, fire and other disaster services are available to 94.1% of the companies in the sample. 2.9% report a lack of such services, 2.9% have only volunteer fire service available, and 2.9% did not comment.

While the availability of outside assistance is impressively high, an analysis of the estimated response times given in answer to Question 7b. tends to dilute the impression. This is particularly evident when the response times are considered against the experience of a professional fire fighter that the most critical period in an industrial fire is the first three minutes.[15]

7b. Response Time	% of Companies
0-3 minutes	8.8%
4-5 minutes	38.3%
6-10 minutes	32.4%
11-20 minutes	5.9%
Greater than 20 minutes	2.9%
No comment	11.8%
	100.1%

[15] From an interview with Fire Chief [illegible] L. Torrison, U. S. Naval Postgraduate School, Monterey, California, on 10 January 1964.

The response times would suggest a necessarily high degree of reliance by the individual firm upon company fire fighting and medical facilities as opposed to community facilities; but this reliance must be conditioned by an assessment of the "saturation level" of the company capability in this regard--how serious must the disaster be before the plant's professional disaster control teams are no longer able to cope with it? A practical solution to the problem is derived through the utilization of a group that with proper training and organization can transfer itself into effective Damage Control teams--the employees themselves.

TABLE V

Question 8.: Statistics

8a. Yearly Average Number Lost Time Accidents

0-1	20.6%
2-5	14.7%
6-10	14.7%
11-25	11.8%
26-50	2.8%
51-100	14.7%
No answer	14.7%
	99.9%

8b. Yearly Average Lost Man-Hours

0-50	11.8%
51-100	2.9%
101-500	11.8%
501-1000	11.8%
1001-1500	11.8%
Greater than 25,000	20.6%
No answer	29.4%
	100.1%

8c. With respect to dollar impact of the above experience:

76.5%	had maintained no records
5.9%	had maintained records or estimates
5.9%	estimated increasing rate of experience
11.8%	did not answer
100.1%	

8d. Report of Significant Lost Time Occurrence

None	5.8%
Minor	32.3%
Major	17.7%
Decreasing Exp.	2.9%
No answer	41.2%
	99.9%

8e. Report of Recent Fire in Plant

None	23.6%
Minor	50.0%
Major	11.8%
No answer	14.7%
	100.1%

TABLE VI

Question 9.: Insurance

9a. With respect to insurance, answers were as follows:

Insured through underwriter	82.3%
Self insured	8.8%
Partially both	2.9%
No answer	5.9
	99.9%

9d. Insurance Rate Experience

Increasing	23.6%	(attributable to increasing trend in costs generally)
Decreasing	20.6%	(attributable to good accident and fire experience)
Stable	26.5%	
No answer	29.4%	
	100.1%	

Questions 9b. and 9c. were with two exceptions, unanswered by respondent firms.

DEVELOPMENT OF INITIATION COST EQUATION

It can be verified from Table I in Chapter II that initiation of the model plan at O & R Jacksonville cost approximately $11,000. Table I provides a breakdown of this cost by element.

In order to approximate an initiation cost for organizations whose size varies from that of the O & R, it is considered that the amount of floor space and the number of employees are two variables that:

1. are measurable common factors of any industrial organization.
2. are independent factors each being approximately linear for establishing the number of required disaster control teams, the amount of equipment, and the extent of construction necessary for any organization adopting the model.
3. are factors easily employed for an approximation of initiation cost.

A further consideration of developing an approximation of initiation costs of the model is that it will include only costs accruing directly out of plan implementation, i.e., it assumes a reasonable availability of facilities and equipment already on hand as required by conventional industrial, medical, and fire prevention plans in existence.

It is estimated that 80% of the cost shown in Table I under the headings "Top Management" and "Departmental" were incurred during model formulation, while the remaining 20% was applicable to initiating the model at the O & R; and it would appear not unreasonable to allot $500 as a fixed cost of plan initiation by an organization adopting the model.

Those costs shown in Table I under the headings "Drafting," "Construction," "Equipment," "Training," and "Drills" are considered

to vary linearly with the size of an organization defined in terms of floor space or number of employees. Both of these factors are considered as independently affecting costs and are assigned equal weight.

With the above assumptions and considerations, an equation expressing approximate initiation costs of the plan for any size company can be written:

Initiation Cost	=	IC	
Fixed Costs	=	FC	
Variable Costs	=	VC (	Drafting service, Plant Const. Equipment, Training, First Drill)
No. of Employees	=	E	
Floor Space (sqft)	=	S	

Considering variation of size in terms of E only:

$$VC_{O\&R} = f_1 \times E$$

$$\$12,100 = f_1 \times E$$

since $E_{O\&R} = 3100$ people $f_1 = \$3.90$/employee

Similarily, considering variation of size in terms of S only:

$$VC = f_2 \times S$$

$$\$12,100 = f_2 \times S$$

Since $S_{O\&R} = 10^6$ sqft $\quad f_2 = \dfrac{12.1 \times 10^{-3}}{10^6} = 12.1 \times 10^{-3} = \$.012$/sqft

Combining all factors: $IC = FC + \left(\dfrac{f_1 E + f_2 S}{2}\right)$

$$IC = 500 + \left(\dfrac{3.9(E) + .012(S)}{2}\right)$$

Check: $E_{O\&R} = 3100$

$S_{O\&R} = 10^6$

$IC_{O\&R} = \$12,600$

$$\$12,600 = 500 + \frac{(3.9 \times 3100 + .0121 \times 10^6)}{2}$$

$$\$12,600 = 500 + \frac{(12,100 + 12,100)}{2}$$

$$\$12,600 = 12,600$$

APPLICATION OF COST EQUATION

In order to determine the reasonableness of the equation, consider two companies, one larger and one smaller than O & R Jacksonville:

	Company A	Company B
E	500 employees	5,000 employees
S	150,000 sqft	2,500,000 sqft

$$IC_A = 500 + \frac{(3.9 \times 500 + .012 \times 150,000)}{2}$$

$$= 500 + \frac{(1950 + 1800)}{2}$$

$$= \$2,375$$

$$IC_B = 500 + \frac{(3.9 \times 5000 + .012 \times 2.5 \times 10^6)}{2}$$

$$= 500 + \frac{(19500 + 30,000)}{2}$$

$$= \$25,250$$

It should be noted in applying the initiation cost equation that approximations will tend toward high estimates since no method is provided to deduct spill-over from other programs of safety and fire

protection already in force; nor are economies of scale that would accrue to larger organizations considered.

Table VII is derived from available National Fire Protection Association statistics to provide the reader with an average expected loss per occurrence by industry for fire only. These statistics, of course, cover a broad continuum of severity--from wastepaper basket fires with negligible loss through complete loss of plant and equipment. But recall that the statistical loss for all industry ($5000 in 1962) does not include the hidden losses mentioned earlier in this paper which are estimated to be in the order of five times the direct loss. Consider further that only one type of disaster--an industrial fire--is reflected, and a favorable comparison between plan implementation cost and average industrial fire losses begins to emerge.

TABLE VII

FIRE LOSSES ($) CLASSIFIED PER OCCURRENCE

Industry	1961*	1962**	Change
Food Processing	3200	4700	+ 1500
Chemical Petroleum	7600	9100	+ 1500
Machining	10700	10000	- 700
Mineral	14000	20000	+ 6000
Educational	4100	5000	+ 900
All Industry	4900	5000	+ 100

* Quarterly of the National Fire Protection Association, Vol. 56, No. 2, October, 1962, pp. 186-187.

**Quarterly of the National Fire Protection Association, Vol. 57, No. 2, October, 1963, pp. 196-197.

VALUE ANALYSIS OF PLAN ADOPTION

Although a rough approximation of initiation costs of the model can be derived, there is no similar formula by which an industrial manager can determine the absolute advantage of the model applied to a disaster situation.

If reasonable predictions could be made as to the probability that any given company was going to experience a fire or other disaster during any given period of time, and similarly; if probabilities could be assigned for the range of loss from negligible to total, then initiation costs of the model could be weighed against expected losses.

The probability of an aircraft crash into a facility. For those readers who are associated with factories and companies in close proximity of airfields, there is application of the "Simulation Technique"[16] which can be utilized to assess scientifically the probability of an aircraft crash into the facility, and, which can be considered as an assist to the industrial manager in deciding whether the model plan is worth adapting to his particular situation. (It is recognized that the actual probability of such occurrence may be exceedingly remote for some firms; the example is drawn only to present a demonstration of the technique and as a possible assist for those with factories very close to air facilities.)

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[16] For a basic and practical application of Simulation Techniques see: Edward H. Bowman and Robert B. Fetter Analysis for Production Management (Homewood, Illinois: Richard D. Irwin, Inc., 1961), pp.343 ff.

Figure 10 represents an area of known size with an air facility at the center. Associated traffic patterns and approach corridors are indicated. Also indicated are concentric diameter rings of known distance from the facility, and portions of a 360° compass radiating from the center of it.

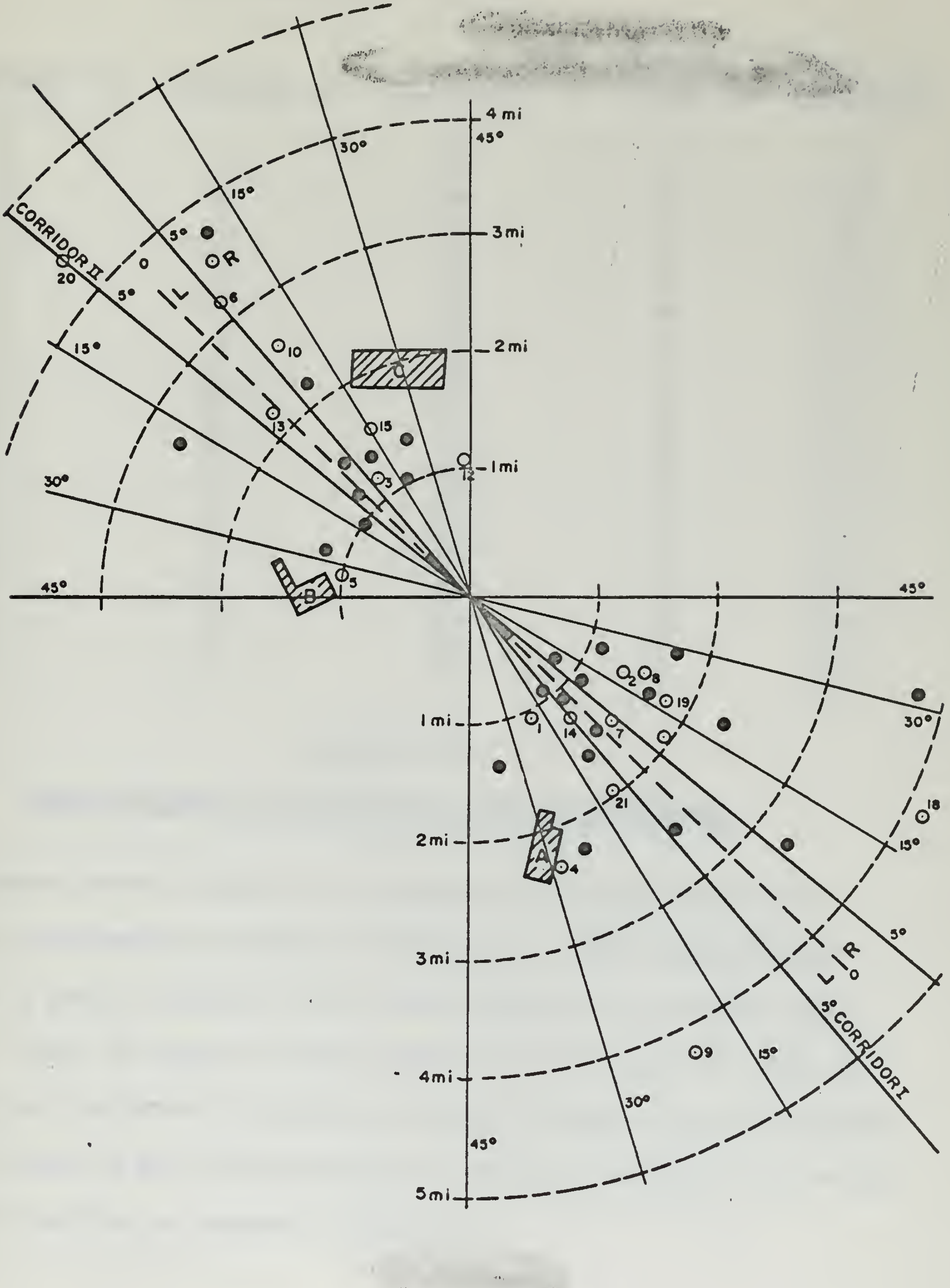
Three factories have been located on the figure as represented by the small areas A, B, and C. Finally, each unnumbered dot represents the historical location of an aircraft crash over a twenty-five year period.

Assume that the azimuth of the historical crashes (dots) are distributed "normally" with an average ($\bar{X}$) distribution having as its standard deviation, 20°. Consider further that the distribution of each crash is "exponential" in terms of its distance away from the facility.[17] Based on the two normal distributions (centering around the two corridors in the figure) and the exponential distance distribution, a simulation problem using Random Numbers can now be established to determine the probability of a crash on one of the three factories. TABLE VIII simulates the random number generation.

[17] Based on the premise that more crashes will occur close to a landing and take-off facility than at a considerable distance; a pilot in trouble will look first for a suitable field, and will approach it directly if altitude permits. The ability of a pilot in trouble to maneuver to avoid structures is based on his altitude, speed and distance from the structure.

FIGURE 10.

CRASH PROBABILITY DIAGRAM



Occurrence	RN	Corridor	RN	°'s from C/L	RN	Side of C/L	RN	Dist. fr. Facil.(mi)
1	x	I	x	23	x	L	x	1.1
2		I		18		R		1.4
3		II		06		L		1.3
4		I		28		L		2.4
5		II		35		R		1.0
6		II		05		L		3.2
7		I		02		R		1.6
8		I		19		R		1.5
9		I		09		L		4.3
10		II		07		L		2.6
11		II		41		R		1.1
12		II		22		R		1.8
13		II		02		R		2.2
14		I		05		L		1.3
15		II		15		L		1.5
16		I		18		R		4.2
17		II		08		L		3.6
18		I		21		R		1.2
19		I		17		R		1.7
20		II		05		R		2.4

TABLE VIII

RANDOM NUMBER (R/N) SIMULATION OF CRASH OCCURRENCES

Points derived through the application of randomly generated numbers are circled and numbered on Figure 10. (The unnumbered dots present a graphic display of the actual history of air crashes in the area.) Since the period of time covered by this history is twenty-five years, and the number of crashes also numbers twenty-five, the frequency of occurrence in the Simulation may be taken to be one/year, and at the location circled and numbered on Figure 10.

It should be apparent, then, that the industrial manager can, through the utilization of Simulation technique, systematically assess the likelihood that a specific type of disaster will occur. It is likewise apparent that, given a history of damage severity upon which to base the "randomness" of occurrence, he can develop a systematic appraisal of the expected extent of damage.

CONSIDERATION OF MODEL EFFECTIVENESS

Armed now with "educated guesses" as to the likelihood and extent of damage occurring, the manager can compute total expected loss without the model disaster control plan in effect:

Capital Investment = CI

Probability of an occurrence during a given time period, $(t) = P_{(t)}$

Expected % loss = L (in decimal percentage)

Insurance Coverage = I

Expected Loss $(t)_{wo} = (P_{(t)} \times L \times CI - I) + 5(P_{(t)} \times L \times CI)$

Similarly, he can make a computational estimate giving consideration to the fact that the model plan has been incorporated into his organizational structure. In this situation, however, an additional estimate of model effectiveness (ME) is necessary. ME is the individual estimate by which the presence of the model plan is expected to reduce L. That is, if L is estimated at .25, and ME is estimated at .5, then

$(ME)\ (L) = .5 \times .25 = .125$

Then,

$$\text{Expected Loss}_{(t)w} = (P_{(t)} \times L \times ME \times CI - I) + 5(P_{(t)} \times L \times ME \times CI)$$

Savings to be expected over a given period of time, in the event a disaster is experienced during that period, is a function of:

Expected Loss $_{(t)}$ wo

Expected Loss $_{(t)}$ w

Cost of initiating and maintaining the model during the same period.

Data from NAS Jacksonville shows maintenance cost for the first year of operation to be $32.00. This is approximately 0.3% of initiation cost for the model. Maintenance cost include only those costs experienced because of model initiation. The costs of drills during the year is not included since this was a pre-initiation cost.

From the above considerations, expected savings in the event of a disaster may be expressed as follows:

$$\text{Expected Savings}_{(t)w} = \text{Expected Loss}_{(t)wo} - \left[IC(1+i+m)^t + \text{Expected Loss}_{(t)w}\right]$$

where i = rate of interest that could be obtained if initiation funds were invested elsewhere

$$m = \frac{\text{maintenance cost per year}}{IC}$$

As an example, consider Company A, which has 500 employees, 150,000 sq ft of production space, and $2,500,000 in capital investment. The company is 100% underwritten for fire loss:

The manager estimates the following:

Probability of a fire during the next ten years $= P_{(t)} = .10$

Expected % Loss $= L = .25$

Model Effectiveness $= ME = .5$

Interest Attainable $= i = .06$

Maintenance cost per year/IC $= m = .005$

$$\text{Expected Loss}_{(t)wo} = (.10 \times .25 \times 2.5 \times 10^6 - .1 \times .25 \times 2.5 \times 10^6)$$

$$+ 5(.10 \times .25 \times 2.5 \times 10^6) = 0 + 5(62,500)$$

$$= \underline{\$312,500}$$

$$\text{Expected Loss}_{(t)w} = ME(\text{Expected loss}_{(t)wo}) = .5 \times \$312,500 = \underline{\$156,250}$$

$$\text{Expected Savings}_{(t)w} = \text{Expected Loss}_{(t)wo} - \left[IC(1+i+m)^{(t)} + \text{Expected Loss}_{(t)w} \right]$$

$$= \$312,500 - \left[\$2375(1 + .06 + .005)^{10} + \$156,250 \right]$$

$$= \$312,500 - (\$4458 + \$156,250)$$

$$= \$312,500 - 160,708 = \underline{\underline{\$141,792}}$$

Lest the savings above appear overly optimistic, reference will be made to another example. Using the same basic data, except that the Expected Loss $_{(t)wo}$ for a ten year period is 5(5,000) = \$25,000; the actual loss of \$5,000 is covered by insurance, and the \$25,000 represents the hidden cost.

Now,

$$\text{Expected Savings}_{(t)w} = \$25{,}000 - \left[\$2375(1 + .06 + .005)^{10} + .5 \times 25{,}000\right]$$

$$= \$25{,}000 - \left(\$4458 + \$12{,}500\right) = \underline{\underline{\$8{,}042}}$$

In other words, Company A, experiencing one $5000 fire (average for industry) for which it is insured, having spent $2,375 as initiation cost for the model and with a model effectiveness of 50% can expect to reduce the expected loss from fire a little more than 30% providing the probability of 1.0 is assigned as the likelihood of occurrence during the period under consideration.

COST SAVINGS BARRING DISASTER

Schlaifer indicates that it is impossible to make sure that every decision will turn out to have been right when these decisions are made under conditions of uncertainty.[18] This is certainly true when trying to decide the amount of dollar savings that can result from the use of a disaster control plan. If it were possible to determine in advance just when a fire, hurricane, explosion, earthquake or flood was going to occur; or when a falling aircraft was going to crash through the roof structure of a plant; and, if these events occurred, what their cost was going to be, then it would be much easier to determine how much money to spend to reduce or minimize the effects of such disasters.

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[18] Robert Schlaifer, Introduction to Statistics for Business Decisions, (New York: McGraw Hill, 1961), p. 3.

The Cost of Uncertainty. Under uncertainty, management is forced in effect, to gamble. Previous histories of such occurrences actually happening put management in a position where a "bet" must be made, hoping that the bet may be won, but knowing it may be lost. Under such circumstances, a right decision consists of a choice of the best possible "bet" (alternative); whether it is won or lost is a matter after the fact.

Let us now consider two value judgments as a method of assessing the choice between implementing a disaster control plan similar to the model, or not doing so as the case may be; and, determine the expected savings which accrued at O & R Jacksonville as a direct result therefrom. For the purpose of the following analysis, consider that no advantage will be derived from use of the plan in terms of reduced property loss in the event of disaster, and that the only advantage which is derived will be as a result of the better organization that the plan allows. It will be left to the reader to adjust or adapt as necessary the following examples to his own specific circumstances.

The Reduced Expected Cost of False Alarms. At O & R Jacksonville, historical records indicated that there was a fire alarm (automatic or manual) sounded within the department (1 of 11 zones) on the average of two and one-half times per month over a ten year period. Of this average, two per month were assessed as false; the remaining one every two months was actually caused by a fire. The relative

frequency of occurrence of these false alarms in one particular zone as compared to the other ten zones was such that Zone 347 had a false alarm three times as often, and Zones 341, 342, 345, and 346 had a false alarm twice as often as the remaining six zones.

Table IX sets forth the eleven O & R Fire and Hurricane Zones, the average number of workers employed in each zone (who, prior to the installation of the model plan, would normally have evacuated each zone during a fire alarm, false or otherwise), the number of workers who man fire stations only (under the model plan), and the number of workers who now remain at their jobs unless directed to secure (an event which will not occur during a false alarm). Table IX also indicates the relative frequency of false alarm occurrence within each zone with respect to each of the other zones.

The average time required to answer, assess, and terminate each false alarm was twenty minutes. However, the historical distribution of these times ranged from not less than ten minutes, to times in excess of one hour, thus presenting the skewed distribution seen in Figure 11.

Naval Industrial Fund (NIF) direct and indirect labor (overhead) was normally budgeted at the rate of $7.00 per total manhours worked.

Given the relative frequency of false alarms among the various zones, and the skewed distribution of time required to administer each false alarm, a simulation problem may be established for this

TABLE IX

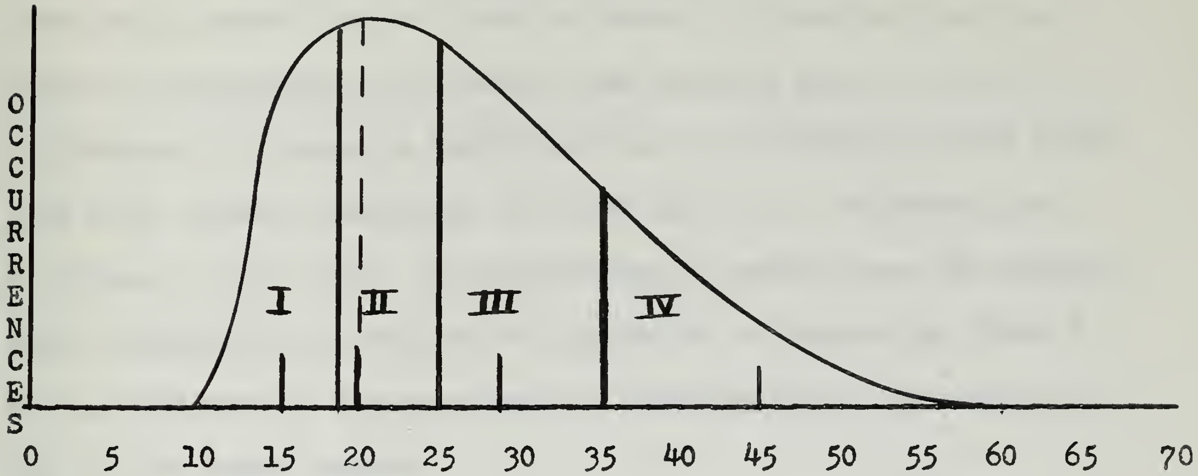
FIRE AND HURRICANE ZONES OF O & R JAX

(PERSONNEL MANNING CHARACTERISTICS)

ZONE	PERSONS EMPLOYED IN ZONE	FIRE STATIONS NEW PLAN	PERSONS REMAINING ON THE JOB (NEW PLAN)	RELATIVE ALARM OCCURRENCE
	(1)	(2)	(3)	(4)
224	65	15	50	1
227	229	25	204	1
336	54	20	34	1
341	378	60	318	2
342	435	20	415	2
343	78	8	70	1
345	140	18	122	2
346	600	55	545	2
347	675	40	635	3
348	271	25	246	1
349	75	22	53	1

FIGURE 11

DISTRIBUTION OF TIME TO ADMINISTER ALARMS



AREA	R/N	APPLY AVERAGE MIN
I	10-18	15
II	19-25	20
III	26-35	29
IV	36-60	45

NOTE: Discard R/Ns drawn but not assigned.

Average time-20 min., Maximum time-60 min., Minimum time-10 min.
Verticle lines divide total Area into equal parts

example, again using the random number technique.[19]

Consider a time period of one month in which two false alarms occur. As can be seen from Table IX, a false alarm in Zones 224, 227, 336, 343, 348, and 349 are all equally likely, whereas an alarm in Zones 341, 342, 245, and 346 is twice as likely, and an alarm in Zone 347 is three times as likely to occur. By weighing each possibility of occurrences as one unit, then totaling units, a sum of 17 is obtained. In order to facilitate the use of standard random tables (two digit numbers), multiply the total units (17) arbitrarily by 5 to obtain a value of 85. By distributing 85 numbers over the relative alarm distribution, a pattern for simulation is obtained in Table X, i. e., each unit of occurrence may be simulated by the selection of one of five random numbers.

Next, consider the skewed distribution of time required to administer each alarm. By assigning random numbers to segmented areas under the curve which represent time periods, a simulation of time may also be obtained for each alarm.

Once the zones under alarm in any one month is determined, and the time each zone remains under alarm is likewise determined, the difference in numbers of personnel required to function under the old method and the new (Table IX, Column 3) multiplied by the time off the

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[19] Bowmar and Fetter, loc., cit.

TABLE X

RANDOM NUMBER ASSIGNMENT FOR SIMULATION OF ALARM

IN O & R FIRE AND HURRICANE ZONES

ZONE	RELATIVE FREQUENCY OF OCCURRENCE	RANDOM NUMBER ASSIGNMENT
224	1	01-05
227	1	06-10
336	1	11-15
341	2	16-25
342	2	26-35
343	1	36-40
345	2	41-50
346	2	51-60
347	3	61-75
348	1	76-80
349	1	81-85

NOTE: discard R/Ns drawn but not assigned (00,86-99)

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]		[illegible]
[illegible]	[illegible]	[illegible]
[illegible]		[illegible]
[illegible]	[illegible]	[illegible]
[illegible]		[illegible]
[illegible]	[illegible]	[illegible]
[illegible]		[illegible]

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job (obtained from Figure 11), and again by the NIF labor overhead rate of $7.00 per hour, will provide an estimate of expected savings resulting from using the new system.

For example: Assume that the Random numbers (R/Ns) 28 and 61 are drawn from standard random number tables to determine the zones under alarm. These R/Ns applied to Table X indicate that Zones 342 and 347 are simulated as having a false alarm in January. Next, assume that the R/Ns 04 and 53 are selected to be applied to Figure 11 to determine how long each of the two zones are under alarm. Since the R/N 04 was not assigned, it should be discarded and another drawn. Therefore, assume that the R/N 22 is drawn to replace the unassigned R/N 04. It will be noted in the first instance, that the R/N 53 when applied to Figure 11, falls in area IV which signals the application of the average time of 45 minutes to be applied; likewise the R/N 22 falling in area III under the curve of Figure 11 signals that 29 minutes should be applied to the other occurrence. Finally, noting from Table IX that in Zone 342, 415 men will remain on the job as a result of the new plan, when the zone is under alarm for 45 minutes (Figure 11), and that in Zone 347, 635 men will remain on the job when that zone is under alarm for 29 minutes, we can establish the following expected cost saving equations.

For:	Zone 342,	415(men)	x 45/60(time)	x $7.00	=	$2179
	347,	635	x 29/60	x 7.00	=	2148
		Expected Savings Simulated for Jan.				$4327

Similar simulations may be made for other months, thus creating an indication of the possible annual savings or average monthly savings as a result of handling false alarms in the manner prescribed in the model plan. As mentioned in Chapter II, the expected average monthly savings derived by actual data at O & R Jacksonville, was $3000/month, to which the above simulation compares favorably.

THE REDUCED EXPECTED COST OF SECURING FOR HURRICANES.

Consider further the reduced cost required to effect adequate hurricane security when required at O & R Jacksonville. Here again, the reader can assess his own similarity of situation and apply the following cost reduction criteria if it is applicable.

By military order, O & R Jacksonville was required to establish various conditions of security based on U. S. Weather Bureau hurricane forecasts for the Northeast Florida area. As previously quoted (Chapter II), O & R top management indicated that as a result of the model plan, the time required to shut down the plant under Hurricane Condition I (most severe) was reduced from six to two hours. This shutdown involved the effort of about 1000 production workers, whereas prior to the plan, plant shutdown was accomplished by plant maintenance personnel (about 250 workers). Similarly, upon securing from a set condition, the time to regain normal capacity operations was reduced from three hours to one hour and involved the same number of workers.

Military Instruction also established hurricane condition

criteria, i. e., three conditions of hurricane security were established; Condition III was a seasonal condition set on 1 July of each year and remained in effect until 1 January of the following year. This Condition required a general policing of the outside area, along with reports to higher authority as to the condition having been set; and the inventory of hurricane securing equipment. Condition II was set whenever Jacksonville was within the twenty-four hour projected path probability of an established hurricane. This condition required a personal supervisory check of Condition III maintenance and a breakout of hurricane security equipment. Condition I was set when Jacksonville was within the twelve hour projected path probability of an established hurricane (hurricane imminent) and required complete plant "shutdown and secure" until Condition II could be re-established. Since the setting of Conditions III and II, and the actual time secured under Condition I held equal weight under the new plan as well as the old, only the time required to actually "set" Condition I had a marginal cost aspect which differed from one plan to the other. The new plan also utilized about 750 production workers over and above the 250 plant maintenance personnel normally used under the old securing system.

Since plant securing time was reduced four hours and unsecuring time was reduced two hours under the new plan, the plant could, in effect, continue to operate six hours longer under the new plan than

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could have been allowed previously when Condition I was set.

The following example will serve to demonstrate another approach in determining expected hurricane securing cost reductions from using the new plan. Once again, the NIF labor overhead of $7.00 per hour normally budgeted to the cost of production will be used.

Historical records indicated that hurricane warnings requiring the setting of Condition I occurred at Jacksonville on the average of one time every three years, and lasted for an average period of 24 hours. The plant, operating under a five-day week, would not lose productive time if security was set on Saturday or Sunday. The distribution of the particular day during the week upon which hurricane conditions had to be set was "rectangular." All workers not engaged in shutdown operations were considered on the payroll as of the time the alarm was set until the end of the normal working day.

Cost of shutdown under old system.

250 - workers (plant maintenance)
x$7.00 -/hr NIF Budget Cost
$1750 -/hour
x 9 - hours required to shutdown and then reopen

$15,750 - Total Cost to Shutdown and Reopen for each Condition I set. (Old Plan)

Cost of shutdown under new plan.

1000 - workers
x $7.00 -/hr NIF Budget Cost

$7000 -/hour
x 3 - hours required to shutdown and reopen
$21,000 - Total Cost to Shutdown and Reopen for each Condition I set. (New Plan)

Difference of productive time cost--savings available under new plan.

```
       9 hours required to secure and unsecure under old system
     - 3 hours required to secure and unsecure under new system
       6 hours productive time not sacrificed
  x 2750 production workers (3000 plant workers less 250 maintenance workers)
  16,500 manhours not sacrificed
 x $7.00/hour NIF Budget cost
$115,500 productive time cost savings
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Total savings for each setting of Condition I

115,500 - (21,000 - 15,750) =$110,250

Assuming that a shutdown was called on a working day, (Monday through Friday), by using 750 production workers in addition to 250 plant maintenance workers, the actual plant securing and unsecuring could be delayed six hours, resulting in a marginal cost savings of $110,250 on each occurrence. Assuming that warnings were set on Saturday and removed on Sunday, no marginal savings would accrue since the old method of using plant maintenance personnel would be used. If however, a warning occurred on Friday and was removed on Saturday, a partial cost involving the four hour differential for securing would apply. Similarly, if Condition I was set on Sunday and removed on Monday, the two hour differential for unsecuring would provide a partial cost savings. Table XI sets forth the average savings which will accrue assuming the savings specified in the Table for securing on one particular day and unsecuring 24 hours later. The average cost indicated in Table XI also assumes that a warning on any one day is equally likely, i.e.,

has a probability of 1/7.

TABLE XI

EXPECTED COST SAVINGS FROM DELAYED SECURING/UNSECURING

DAY SECURED	DAY UNSECURED	TIME DIFFERENTIAL (hours)	EXPECTED SAVINGS
Monday	Tuesday	6	$110,250
Tuesday	Wednesday	6	110,250
Wednesday	Thursday	6	110,250
Thursday	Friday	6	110,250
Friday	Saturday	4	73,500
Saturday	Sunday	0	0
Sunday	Monday	2	36,750
			$551,250
			x 1/7
Total expected savings (each occurrence) regardless of day of occurrence			$ 78,750

Given that Condition I will be set on an average of once every three years: $78,750 / 3 = $26,250 (The expected savings per year resulting from hurricane security under the new plan).

SUMMARY

This Chapter has presented the compiled results of a questionnaire (Appendix B) that was sent to two hundred industrial organizations of varying size and function. While the level of response (17%) was considerably less than hoped for, the data received was useful in demonstrating the lack, in general, of an overall plan of disaster control in American industry; additionally, that there are indications of a dangerously high degree of company dependence upon full-time fire and medical personnel for the control and minimization of damage.

The development of a cost equation for evaluating the implementation cost of a disaster control plan in individual firms was described and illustrated. Comparison to NFPA average fire loss statistics in different industries was provided to support the industry-wide adaptation of Naval Damage Control principles.

Finally, the Chapter led the reader through an examination of the possibilities surrounding an application of Simulation techniques to questions of disaster frequency and severity within an individual firm. An approach for evaluating the model disaster control plan exclusive of any advantage derived from actual damage minimization was also presented in the form of two examples: Reduced expected cost of false fire alarms at O & R Jacksonville and reduced cost of hurricane preparation.

CHAPTER V

EPILOGUE

LIMITATIONS OF APPLICABILITY

Throughout the presentation of this paper, it has been the intent to demonstrate the possibilities surrounding an application of Naval Damage Control principles to American industry. Specifically, the purpose has been to show that the development of an overall plan to coordinate the activities of employees during an emergency can be of significant value to the individual firm in controlling and minimizing damage to facilities.

It is patently clear that the model plan developed for use at O & R Jacksonville will not be suitable for precise duplication at every industrial organization. Conceivably, the implementation of a plan to divide a firm into the pattern of Areas and Zones discussed in Chapter II, and to establish the disaster control teams required by the division, could prove to be grossly impractical and unwieldy.

It is manifest, then, that the "mechanics" of organization for any individual firm can be developed most effectively by the person who has the greatest knowledge of that firm--the individual industrial manager. In the acceptance of this industrial fact of life, the writers have not attempted to show the advantages of an identical model plan implementation in industry, but rather, the benefits that <u>have</u> been realized at O & R Jacksonville, and which by appropriate plan modification, could accrue to other industrial organizations.

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There are no harbored illusions that the conversion by American industry to a coordinated plan of disaster control will gain overnight widespread acceptance. It is unfortunate, but nonetheless true, that a substantial number of readers will reject the model presented as "too much ado" about a phase of industrial life about which an industrial manager has too little interest. A most meaningful evidence of this apathetic attitude was the disappointingly low response (17%) to the survey questionnaire forwarded for completion and return.

Yet the principle of controlling damage is generally accepted as sound. There is no other explanation for the sizeable expenditures for fire protection, fire prevention, first-aid facilities, special fireproof structures, and industrial safety devices within American industry. In this context, the decision to ignore a readily available group--the employees--that with proper training and organization can transform itself into effective Damage Control teams must surely be questioned.

All that remains is to recount some mistakes made in formulation of the survey questionnaire, and to suggest some possibilities for further research.

SHORTCOMINGS OF THE SURVEY QUESTIONNAIRE

It is recognized now that the question phrasing, notably question 5 (a) and 5 (b) is too attractive for a broad, generalized, and

non-informative answer. Further, question 6 should have been rephrased to include a request for copies of the First-Aid, Industrial Safety, Fire Prevention, etc., programs reported as being in effect. This would have served two purposes: 1) the acquisition of an expanded description of company programs for more accurate survey compilation, and 2) facilitating questionnaire completion by requiring less of the respondent's time necessary to research the requested information.

Question 7 (d) likewise should have included a request for appropriate written instructions to provide a basis for sensible compilation.

The accompanying letter of explanation for the survey contained the following statement:

> You are assured that information contained in your response will be held in confidence, and that any publication thereof will be made under complete anonymity unless prior and specific permission to cite your company is obtained.

The above notwithstanding, firms were, generally, unwilling to provide answers to questions 9 (b) and 9 (c) concerning amounts of insurance in force. It is apparent that the use of a questionnaire is unsatisfactory as a method of acquiring this type of proprietary information; and it is believed that direct interviews, while not possible for the writers, would have elicited more information.

POSSIBILITIES FOR FURTHER RESEARCH

An obvious area for additional research presents itself in the

application of the model plan to a specific firm, and compiling comparative advantages and disadvantages over a fixed period of time. One year from the date of plan implementation is suggested as an appropriate interval.

Short of actual conversion to an overall plan of disaster control, another possible area for additional research would be to seek out a small number of companies of assorted size and function. Through utilization of Simulation techniques and with the necessarily close cooperation of management, it should be possible to make a meaningful assessment of the model plan value for each of them. A project of this sort would require accessibility to:

1. company cost records,
2. company history of physical losses and causes thereof,
3. amounts of insurance in force.

Most importantly, it would require a willingness by management to at least consider the idea that they have within their <u>present</u> organization the means for reducing losses.

<u>CONCLUSIONS</u>

This paper has outlined an approach to one of the major problems facing industrial management now and in the foreseeable future. The method of approach is relatively simple. It can be described as "taking a second look" at what can be done with an existing organizational structure to make it more effective in the minimization of

disaster damage.

The decision to adapt the model plan to any individual firm must be based upon the careful weighing of factors, some of which are impossible to evaluate without making assumptions. Simulation techniques have been suggested as a method of systematizing the assignment of probabilities to aid this evaluation.

But utilization of this approach, or any other, is dependent upon the existence of a belief by management that Naval Damage Control principles are worthwhile for American industry--hopefully, the idea has been conveyed.

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APPENDIX A

U. S. NAVAL AIR STATION
JACKSONVILLE, FLORIDA

O&R 3440.1A
Code 860
20 June 1963

O&R INSTRUCTION 3440.1A

From: Overhaul and Repair Officer
To: Distribution List D

Subj: Disaster Control Organization; promulgation of

Ref: (a) Disaster Control Recovery Plan 3-60 (DCRP-6ND)
(b) U. S. Disaster Control Manual (OPNAVINST P3440.6)
(c) NASJAXINST 11320.1C of 4 Dec 1959, Subj: Fire Prevention and Fire Protection Measures
(d) NASJAXINST 3140.2C of 27 Jul 1960, Subj: NAS Hurricane Security Bill
(e) NASJAXINST 3730.1C of 28 May 1959, Subj: NAS Jacksonville Aircraft Hurricane Evacuation Bill
(f) NASJAXINST 3140.1B of 27 May 1958, Subj: Station Storm Bill
(g) NASJAXINST 3440.2D of 18 Jan 1963, Subj: Disaster Control Unit (DCU 6.3.1); Organization of

Encl: (1) Disaster Fire and Hurricane ZONES within the O&R Department
(2) Area Coordinators, Zone Fire and Hurricane Marshals, and other Team Leaders Organization
(3) Zone Disaster Control Team Organization
(4) Area and Zone Disaster Control Organization Boards, Drawings, and Bills
(5) O&R Department Hurricane Security, Aircraft Hurricane Evacuation, and Storm Security Bills
(6) O&R Disaster, Fire and Hurricane Warning Signals
(7) Administrative and Operational Inspection Form for Disaster Control Drills

1. Purpose. This Instruction publishes a disaster control organization plan for the O&R Department which includes organization for fire, damage control, hurricane security, and other assistance needed in time of emergency.

2. Cancellation. This Instruction cancels O&R Instruction 3440.1 of 16 November 1962 and SUP-1 of 13 February 1963.

3. Background. Reference (a) directs NAS Jacksonville to organize, train, and equip a minimum number of disaster control teams as part of the North Florida Disaster Control Group (NORFLA DCG 6.3).

Reference (b) recommends the number and type of personnel, the equipment required, and the functions to be performed by the members of these teams. Reference (c) sets forth fire prevention and fire protection measures for NAS JAX. References (d), (e), and (f) set forth NAS JAX hurricane security, hurricane evacuation, and storm security conditions. Reference (g) establishes the NAS JAX disaster control organization and outlines team assignments. This Instruction supplements reference (g).

4. Organization. Unless otherwise designated, the Assistant Overhaul and Repair Officer is hereby designated Disaster Control Officer for the O&R Department, and will be directly responsible to the Overhaul and Repair Officer for all disaster control plans, training, and organization within the Department. The Production Manager will be his alternate. The O&R Disaster Control Officer shall further be responsible under the provisions of references (d), (e), and (f) for effective implementation of hurricane security, hurricane evacuation, and storm security measures as established in enclosure (5). The same responsibilities, organization, and action required for hurricane security shall apply to storm conditions set throughout the year by NAS Aerology and hurricane evacuation conditions set by COMFAIRJAX. In over-all coordination of his responsibilities, the O&R Disaster Control Officer shall effect liaison with the NAS Jacksonville Disaster Control Unit (6.3.1) as necessary for the effective performance of his office. He shall be supported by a coordinating staff of functional advisers. This staff shall be composed of the following positions. (Personnel occupying the designated billet descriptions shall fill these positions and shall be known as Departmental Disaster Control Staff Assistants.)

DEPARTMENTAL STAFF ASSISTANTS	PERSONNEL BILLET DESCRIPTION
Fire & Hurricane Marshal	Shops Officer
Alternate	Shops Superintendent
First Aid Assistant	Administrative Services Officer
Alternate	Adm Services Superintendent
Damage Control Assistant	Production Engineering Officer
Alternate	Prod Engineering Supt
Communications & Traffic Assistant	Production Planning Officer
Alternate	Prod Planning Supt
Decontamination Assistant	Aircraft Transfer Officer
Alternate	Acceptance & Transfer Branch Supervisor

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The O&R Department shall be divided into two Disaster Control Areas, each of which shall be headed by a Disaster Control Area Coordinator, or his alternate. Each Disaster Control Area Coordinator shall be supported by an Area First Aid Support Team, an Area Emergency Rescue Support Team, and an Area Communication and Traffic Support Team. Each Disaster Control Area shall further be divided into several fire and damage control zones, which correspond to current NAS fire sub-zones (hereinafter referred to only as "zones"). Each zone shall be headed by a Zone Fire and Hurricane Marshal and shall support several Fire and Damage Control Teams under team leaders. Fire and Damage Control Teams shall be composed of those personnel assigned to Fire and/or Damage Control Bills within the various shops within the zone. The Disaster Control Organization as a whole will also be used to accomplish that hurricane security which is required by this Instruction. Disaster Control Areas, with their respective zoning and mobilization points, are specified in enclosure (1). Disaster Control Area Coordinators, their supporting area First Aid, Emergency Rescue, and Communication and Traffic Support Teams, Zone Fire and Hurricane Marshals, and other team leaders, are set forth in enclosure (2). Enclosure (3) provides the typical zone team organization. Enclosure (4) provides the system for training, organizing, and implementing the Disaster Control Program in O&R. Assignment of personnel will be made as required on the various Disaster Control Bills and Organization Boards enumerated in enclosure (4). Distribution of these bills will also be as indicated in enclosure (4). Assignments will be made for each working shift and will be reviewed every six weeks. Each Disaster Control Area Coordinator, assisted by the several Zone Fire and Hurricane Marshals, in turn assisted by the various team leaders and supporting teams, shall be known as an Area Disaster Control Group. The Area Disaster Control Group as a whole is the smallest organizational unit which can function with complete autonomy in any emergency (i.e., in the event of disaster, all of the services normally required of an emergency crew can be provided by each Area Disaster Control Group). The functional elements composing each zone team will include the primary O&R fire fighting capability and necessary engineering services that are required to minimize damage in the event of fire, explosion, contamination, impending disaster, and ready rescue. The zone team will further possess the capability for obtaining and maintaining hurricane security conditions required in enclosure (5). The O&R Decontamination Team will be composed of Military Enlisted personnel and will report directly to the O&R Disaster Control Officer for operational control and to the O&R Decontamination Assistant for technical and administrative control. Disaster Control Team 80 will be composed of those Plant Services Division personnel

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working as a standby crew during non-working hours, and will report directly to the O&R Department Duty Officer for operational control, and to the O&R Damage Control Assistant for technical and administrative control. Enclosure (6) sets forth O&R Disaster Warning Signals. Enclosure (7) provides a format for evaluating all Disaster Control Drills to be held in the department.

5. <u>Action</u>. To implement the administrative organization delineated in the enclosures and to provide a plan of action in any emergency situation, the following responsibilities and authorities are assigned:

a. <u>O&R Disaster Control Officer will</u>:

(1) Insure that the organizing, training, and equipping of assigned personnel are conducted as set forth by enclosure (4).

(2) Insure that liaison is established between departmental and station control elements since the department as an industrial complex is not specifically associated with the NAS Disaster Control Organization.

(3) Be responsible for and assume control over Area Disaster Control Groups when required by emergency.

b. <u>Departmental Disaster Control Staff Assistants will</u>:

(1) Organize Area Support Teams and appoint team leaders as required by enclosure (2).

(2) Develop a syllabus to insure adequate and timely training in specific skills involved.

(3) Provide coordinated training in each of the various skills indicated for personnel assigned to the respective positions in the Area Disaster Control Groups.

(4) Compile specified outfitting requirements and submit list of materials for procurement to the O&R Disaster Control Officer.

(5) Coordinate the specific functions of the Disaster Control Group Teams from a department standpoint when directed by the O&R Disaster Control Officer.

(6) Umpire and evaluate all drills held in the department (enclosure (7)).

(7) Periodically review the functions and organizations for which they are responsible.

(8) Insure that the latest approaches and techniques for action are being employed.

c. <u>Group Superintendents</u> will review enclosure (2) and assign billeted personnel to indicated positions.

d. <u>Each Disaster Control Area Coordinator will:</u>

(1) Assist in the development of Department Disaster Control plans and review area material requirements.

(2) Prepare and locate Area Disaster Control Organization Boards (enclosure (4)).

(3) Insure that appropriate internal Disaster Control Organization Boards, Drawings, and Bills, as required to cope with fire, damage control, and hurricane security, are established and maintained by subordinate zones.

(4) Establish review requirements for personnel assignments to Zone Disaster Control Bills.

(5) Review material requirements for Zone Damage Control Gear Lockers.

(6) Assume operational control of his respective Area Disaster Control Group and be responsible to the O&R Disaster Control Officer for:

(a) The function of his group in any emergency.

(b) The securing of either Disaster Control Area in the event of any emergency based on his judgement and estimate of the situation at hand.

(c) The currency of Disaster Control Bills throughout his area.

(d) The scheduling of disaster control drills within his area so that there is at least one drill per quarter.

e. <u>Each Area First Aid Support Team Leader will:</u>

(1) Take charge of his respective Area First Aid Support Team as organized by the Departmental First Aid Assistant.

(2) Insure that each team member avails himself of the training provided; and keep records of attendance at training sessions for qualification purposes.

(3) Assume custody of first aid equipment as provided and insure proper stowage and inventory of supplies.

(4) Coordinate the over-all capability of his respective team. Unless otherwise directed by the Departmental First Aid Assistant, he will be responsible to his Area Disaster Control Coordinator for the function of his team in any emergency.

NOTE: The complement of each Area First Aid Support Team will be evenly distributed among the various zones, which shall have a minimum of three personnel assigned to the team from each zone. In the event of an area alert, fire, or disaster, the appropriate First Aid Support Team will report to the designated area mobilization point. Team members from each zone will bring with them the equipment for which they are responsible. In the event of a zone fire or emergency, the zone segment of the Area Support Team will report to the involved zone and render necessary aid. When required, each member of the Area First Aid Support Team will be expected to render first aid to any person at any time in his general work area. Aid will be continued until the person can be taken to the dispensary, or until personnel from the Medical Department arrive and take charge. 6

f. <u>Each Area Emergency Rescue Support Team Leader will:</u>

(1) Take charge of his respective Area Emergency Rescue Support Team as organized by the Departmental Damage Control Assistant.

(2) Insure that each team member avails himself of the training provided; and keep records of attendance at training sessions.

(3) Assume custody of emergency rescue equipment as provided, and insure efficient stowage, inventory, and mobility of supplies.

(4) Review material requirements for zone damage control gearlockers and make additional needs known to the Departmental Damage Control Staff Assistant.

(5) Coordinate the over-all capability of his respective team. Unless otherwise directed by the Departmental Damage Control Assistant, he will be responsible to the Area Disaster Control Coordinator for the function of his team in any emergency.

NOTE: Each Area Emergency Rescue Support Team will be complemented with personnel from the Plant Services Division. The teams will be supported by technically rated personnel such as welders, plumbers, riggers, carpenters, electricians, helpers, and others, who will have available to them a mobile supply of tools and equipment which can move quickly with them to the scene of an emergency. Upon the sounding of any area or zone emergency (other than an Alert) the appropriate Area Emergency Rescue Support Team will mobilize itself and its equipment; and will proceed at once to the designated area mobilization point for further assignment. Once on scene, the Area Emergency Rescue Support Team will assume control of Zone Ready Rescue Teams and effect necessary rescue operations.

g. Each Area Communication and Traffic Support Team Leader will:

(1) Take charge of his respective Area Communications and Traffic Support Team as organized by the Departmental Communications and Traffic Assistant.

(2) Insure that each team member avails himself of instruction provided; and keep records of attendance at training sessions.

(3) Coordinate the over-all capability of his respective team. Unless otherwise directed by the Departmental Communications and Traffic Assistant, he will be responsible to the Area Disaster Control Coordinator for the function of his team in any emergency.

NOTE: The complement of each Area Communications and Traffic Team will be evenly distributed among the various zones which shall have a minimum of three personnel assigned to the team from each zone. In the event of an area alert, fire, or disaster, the appropriate Communications and Traffic Support Team will report to the designated area mobilization point for assignment in the control of traffic and communications. In the event of a zone fire or emergency, the zone segment of the Area Communications and Traffic Support Team will report to the affected zone and render the support. Once on scene, the Communications and Traffic Support Team, or segment thereof, will assume control over "handi-talkie" communications provided by Security.

h. Each Zone Fire and Hurricane Marshal will:

(1) Develop Disaster Control Bills, and training and equipment requirements for his respective zone team organizations.

(2) Prepare and locate zone Disaster Control Organization Boards as required by enclosure (4).

(3) Develop material requirements for and provide Damage Control Gear Lockers where unique rescue equipment may be required.

(4) Supervise and coordinate zone team organizations and operations as specified by enclosure (4)

(5) Insure that training plans as established by the O&R Fire and Hurricane Marshal and the O&R Damage Control Assistant are carried out.

(6) Be responsible to the O&R Fire and Hurricane Marshal for the selecting and scheduling of his zone for at least one fire drill per quarter.

(7) Perform and report the results of monthly fire equipment inspections as required by reference (c).

(8) Utilize zone teams to effect hurricane security required by enclosure (5).

(9) Assume operational control of his respective Zone Fire and Damage Control Teams, and be responsible to the appropriate Area Disaster Control Coordinator for:

(a) The functioning of his zone teams in any emergency.

(b) The securing of any zone in the event of any emergency based on his judgment and estimate of the situation at hand.

(c) The currency of Disaster Control Organization Boards, Drawings, and Bills throughout his zone, including the adequate manning of Damage Control Gear Lockers by Ready Rescue personnel. (see enclosure (4), NOTE 1.)

i. <u>Fire Team Leaders will</u>:

(1) Assume functional control of all personnel assigned to fire stations within the appropriate zone, and be responsible to the Zone Fire and Hurricane Marshal for the training and indoctrination of all zone fire fighting personnel.

(2) Assume operational control of O&R fire fighting personnel during zone or area emergency.

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(3) Normally act as first alternate to the Zone Fire and Hurricane Marshal.

j. Damage Control Team Leaders will:

(1) Assume functional control of all personnel assigned to damage control stations within the appropriate zone, and be responsible to the Zone Fire and Hurricane Marshal for the training and indoctrination of all zone damage control personnel.

(2) Assume operational control of O&R damage control personnel during Zone or Area emergency.

(3) Prepare list of equipment and facilities found within his respective zone which require some type of attention in the event of an emergency and/or impending disaster. (Criteria for establishing such a list will be: Could damage be limited or prevented by proper attention to the equipment specified?) These lists of items accompanied by recommendations for action will become a basis for operative action on Damage Control Plans. Copies of these lists will be maintained by Plant Services; the compilation of which will represent "The Department Damage Control Survey."

(4) Initiate equipment requirements for Zone Damage Control Gear Lockers, and recommend size of Ready Rescue Team required to man these lockers.

(5) Normally act as second alternate to the Zone Fire and Hurricane Marshal.

k. Each Shop Supervisor (except in the 2000 Division and 5200 and 5300 Branches where the Branch Supervisor) will:

(1) Assist his respective Damage Control Team Leader in the preparation of lists of equipment and facilities which require some type of attention in the event of an emergency or impending disaster.

(2) Assist in the preparation of material requirements for damage control.

(3) Prepare, post, and assign personnel to Disaster Control Bills within his area.

(4) Explain this Instruction, as necessary, to assigned personnel.

(5) In the event of a shop emergency, assume operational control of assigned Disaster Control personnel and be responsible to his respective Zone Fire and Hurricane Marshal for:

(a) The immediate securing of any shop and/or branch in any emergency based on his judgment and estimate of the situation at hand.

(b) The adequate passing of the word or alarm to the Zone Organization Point in order that others with a need to know are properly informed.

(c) The availability of his assigned disaster control personnel to their respective Fire and/or Damage Control Team Leaders in the event an emergency situation extends beyond his own shop and/or branch.

l. <u>The Security Force (Main Entrance O&R) will</u>:

(1) Sound the proper Zone Disaster or Fire Alarm or Alert signal throughout the Department, as specified in enclosure (6).

(2) Provide one security guard with "Handi-Talkie" to the appropriate mobilization point in the event of any alarm. (Guard will report to the head of the respective area Communications and Traffic Support Team for communication relay to Security Desk.)

(3) Relay necessary communications to intradepartmental disaster control elements as specified in reference (g).

(4) Report fire and damage hazards which are found within the department during working hours to the department Fire and Hurricane Marshal and/or Station Fire Department. After working hours or during shutdown operations, hazards should be reported to the O&R Duty Officer.

m. <u>O&R personnel will</u>:

(1) Man assigned Disaster Control Stations promptly on signal and/or when required.

(2) Promptly report all fires to the Fire Department and potential hazards to the Zone Fire and Hurricane Marshal.

(3) Assist as assigned or directed in the fighting of fires or the minimizing of damage as the result of any emergency.

(5) In the event of a shop emergency, assume operational control of assigned Disaster Control personnel and be responsible to his respective Zone Fire and Hurricane Marshal for:

(a) The immediate securing of any shop and/or branch in any emergency based on his judgment and estimate of the situation at hand.

(b) The adequate passing of the word or alarm to the Zone Organization Point in order that others with a need to know are properly informed.

(c) The availability of his assigned disaster control personnel to their respective Fire and/or Damage Control Team Leaders in the event an emergency situation extends beyond his own shop and/or branch.

l. <u>The Security Force (Main Entrance O&R) will</u>:

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m. <u>O&R personnel will</u>:

(1) Man assigned Disaster Control Stations promptly on signal and/or when required.

(2) Promptly report all fires to the Fire Department and potential hazards to the Zone Fire and Hurricane Marshal.

(3) Assist as assigned or directed in the fighting of fires or the minimizing of damage as the result of any emergency.

(4) Evacuate the area, zone, or shop when directed by the appropriate Shop Supervisor, Zone Fire and Hurricane Marshal, or Area Coordinator, if not specifically assigned to a Disaster Control Station.

6. Hurricane Security

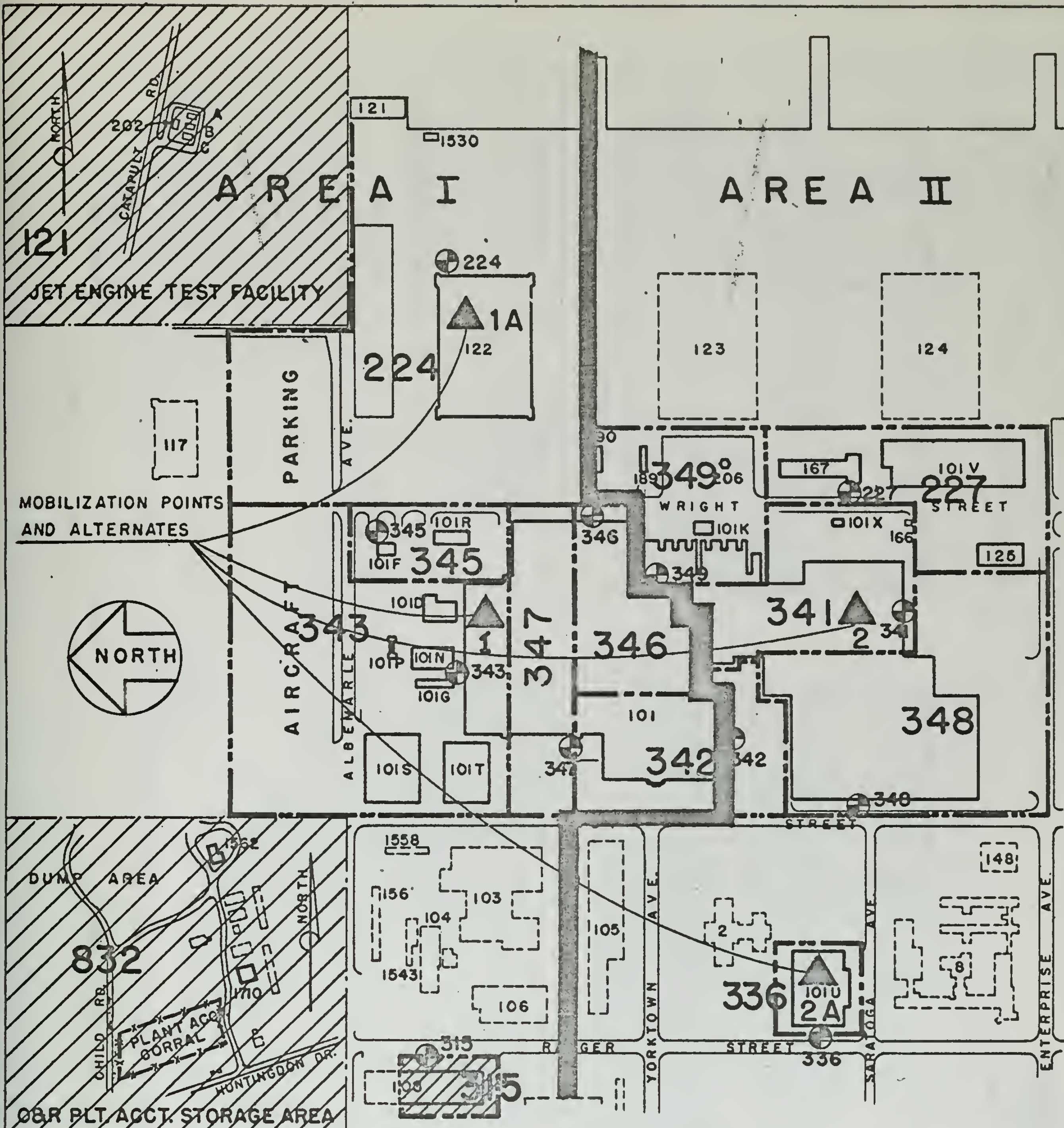
a. All personnel assigned responsibilities by this Instruction, whether military or civilian, must understand and comply with the procedures contained in the detailed instructions of the Hurricane Security, Aircraft Hurricane Evacuation, and Storm Security Bill, enclosure (5).

b. The basic responsibility of all groups and units in the organizational chain of command for disaster control, fire, security of assigned space, material, and related areas of cognizance is not altered by the following superimposed organizational responsibilities:

(1) The O&R Fire and Hurricane Marshal shall be the over-all coordinating authority under the Assistant O&R Officer for the purpose of hurricane and storm security. He will maintain an intra-O&R Hurricane Control Center (Hurricane Central) in the Shops Group Office (extension 279/712).

(2) Zone Fire and Hurricane Marshals have cognizance over their respective zones, as set forth in enclosure (1), regarding all matters of hurricane security.

7. Implementation: This Instruction is effective upon receipt for administration, organization, and training purposes. After suitable determination as to capability of personnel to comply with responsibilities stated herein, each individual Fire and Hurricane Zone will be designated by separate notice as functioning operationally under the provisions of this Instruction. It is anticipated that this Instruction should become fully operational no later than 1 January 1964.



DISASTER CONTROL AREAS (WITH ZONING)

NOTE: Areas 121, 315, and 832 are not included as part of the Disaster Control Organization. However, these areas will be manned by O&R personnel in case of fire. Personnel manning these zones will report to other departments for coordination in accordance with NASJAXINST 11320.1C.

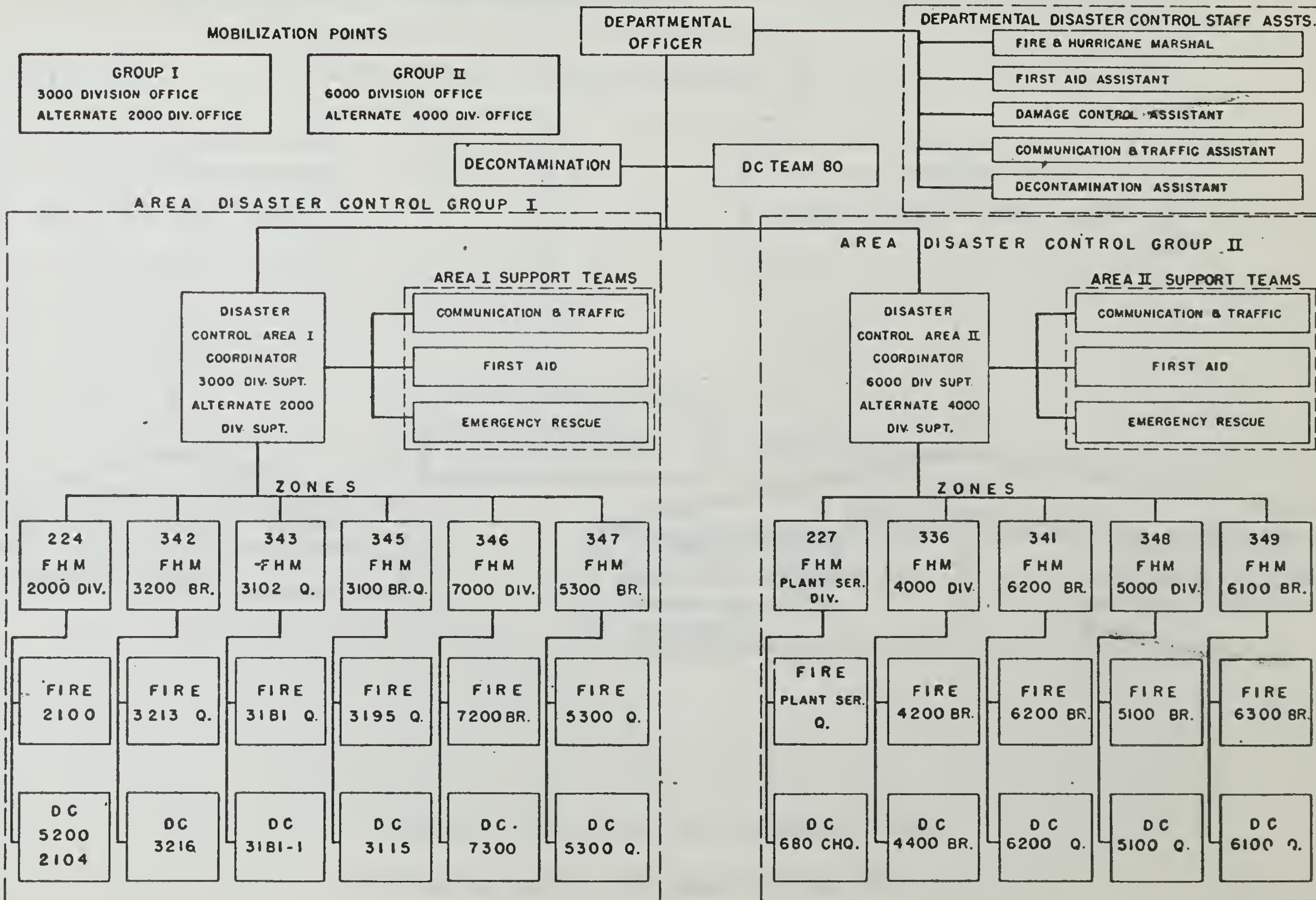
SK.753(A)

OVERHAUL AND REPAIR DEPARTMENT

Enclosure (2)

OBRINST. 3440.1A
20 June 1963

AREA COORDINATORS, ZONE FIRE AND HURRICANE MARSHALS, AND OTHER TEAM LEADERS ORGANIZATION

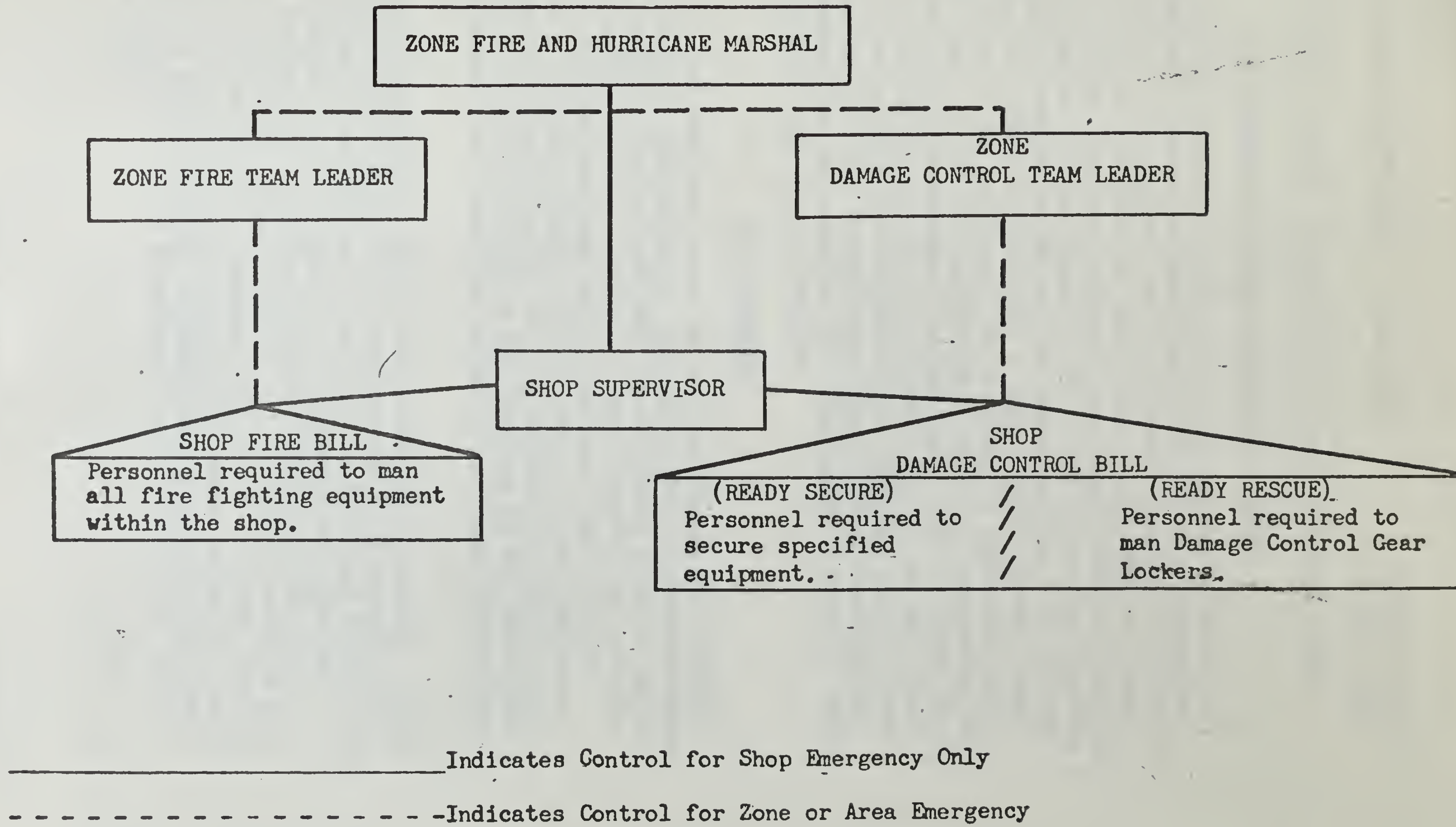


FHM = ZONE FIRE AND HURRICANE MARSHALS
Q. = QUARTERMAN
BR. = BRANCH SUPERVISOR
DIV. = DIVISION SUPERINTENDENT
BR. Q. = BRANCH QUARTERMAN
CH Q. = CHIEF QUARTERMAN

NUMBER ONLY INDICATES SHOP SUPERVISOR

Enclosure (2)

ZONE DISASTER CONTROL
TEAM ORGANIZATION



ZONE DISASTER CONTROL ORGANIZATION BOARDS, DRAWINGS, BILLS

A - DISASTER CONTROL ORGANIZATION BOARDS

1. Each Disaster Control Area and Zone shall display at least one Disaster Control Organication Board which represents a composite planning and action instrument for the disaster control organization within each unit at the area and zone level, respectively. These boards will display the name, location, and phone number of each key-man in the disaster control organization, along with other planning and training information which will be developed from time to time. In addition, the boards will display a copy of all Disaster Control Bills for shops within the Zone. The currency of these Area and Zone Boards shall be the responsibility of the Area Coordinator and Zone Fire and Hurricane Marshals, respectively. One of these boards shall be designated as the zone mobilization point. On this board a space will be provided for indicating the specific shop in which an emergency exists. The person reporting a fire or sounding an alarm is responsible for assuring that this entry is made, in order to guide others to the proper location.

B - DRAWINGS

1. Zone Fire and Hurricane Marshals will coordinate the development of an oblique representative drawing of their respective zones which will depict, locate, and code the following items of information and equipment; zone boundaries, shop layouts, the location of all fire fighting equipment within the zone, the location of all items requiring attention in the event of fire, explosion, alert, or other emergency which, if left unattended, could lesson the chance to minimize damage, and the location of all first aid lockers and boxes, hurricane gear lockers, and damage control gear lockers.

2. Production Engineering Group will assist, as necessary, in the preparation and updating of these drawings and will provide for their distribution as follows: Zone Fire and Hurricane Marshal (2), Disaster Control Area Coordinators (1), Departmental Fire and Hurricane Marshal (1), Department Damage Control Assistant (2), Departmental Disaster Control Officer (1), Station Fire Chief (4). Each Zone Fire and Hurricane Marshal will insure that one copy of his respective zone drawing is prominently posted within his zone; the department Damage Control Assistant will insure that one copy is readily available to the department Emergency Recovery Crews (Plant Services).

[illegible]

[illegible]

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[illegible]

[illegible]

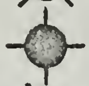
[illegible]

3. Coding. The following coding system is established for the identification of items as discussed in paragraph 1, above:

a. Fire fighting equipment legend (depicted in RED)

 2 lb CO2

 4 lb CO2

 Fire Blanket

 15 lb CO2

 50 lb CO2

 Sprinkler System

 40-Gallon Foam

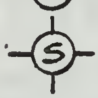
 Magnesium Extinguisher

 Water Pump

 Hose Reel

 Dry Powder

 Soda Acid

 40-Gallon Soda Acid

Zone boundaries and fire alarm boxes will be indicated by pictorial representation on the drawings. Each item will be identified by a 4-unit code, designated on the drawing and on the unit in the zone. The numerical and color coding system for these units is as follows:

AREA		ZONE		ITEM		ITEM NO.
AREA	CODE	ZONE	CODE	ITEM	CODE	
Area I	I	224, 227	A	(Black) Tank	T	0-100
Area II	II	342, 336	B	(Black) Electrical Panel	E	
		343, 341	C	(Black) Valve	V	
		345, 348	D	(Black) Door	D	
		346, 349	E	(Black) Window	W	
		347	F	(Black) Fan	F	
				(Green) First Aid Unit	+	
				(Yellow) Damage Control Locker	X	
				(Blue) Hurricane Gear	Z	

Example: IED 14----Is the 14th coded door in Zone 346, Area I
II AX-1---Is the 1st Damage Control Gear Locker in Zone 227, Area II

[illegible]

C - BILLS

1. Each shop superviser under the direction of his respective Zone Fire and Hurricane Marshal will aid in the development of and assign personnel to a Fire Bill, Damage Control Bill, and Hurricane Security Bill, for the employment of their personnel under specified conditions, as follows:

a. Fire Bills: Standard Form 6ND-NAS-JAX 11320/5 will be used to assign personnel to Fire Stations, in accordance with procedure set forth in reference (c). Assignments should specifically refer to the manning of fire fighting equipment, as depicted in (RED) on Zone Disaster Control Drawings, and shall deal specifically with the fighting of fires. Assignments as to the closing of doors, windows, etc., will become a part of damage control. Distribution of Fire Bills will be as follows: Shop (1), Zone Organization Board (1), O&R Security (1), Fire Department (1), and Area Organization Board (1).

b. Damage Control Bills: Form 6ND-NAS-JAX 3440/3 (2-63) will be used to assign personnel to damage control stations, in accordance with procedure set forth in the basic Instruction and this enclosure.

(1) Equipment requiring attention will be listed on the Damage Control Bill by the code referred to above.

(2) Location of equipment will be specified by the terms - (in shop) or (the outside shop number), including any amplifying data required to locate the item.

(3) Action required shall be specified on the Bill, including any amplifying data considered necessary. (The same information will be specified by a printed card on the item in the shop.)

(4) Responsibility assignments will be made (1) for equipment within the shop which affects any shop and (2) equipment located outside of the specified shop which could have an effect on the shop.

(5) Condition requiring action:

Condition ALFA - (Item in shop) Action necessary for safe secure of own shop, own zone, or own area.

[illegible]

BRAVO - (Item out of shop) Action necessary for safe secure of own shop, own zone, or own area, but will require responsible person in shop to notify person outside of shop to take necessary action.

CHARLIE - (Item in shop) Will require notification from outside shop to take action.

(6) Distribution of shop Disaster Control Bills will be as follows: Shop (1), Zone Organization Board (1), Area Organization Board (1), Department Damage Control Staff Assistant (1).

C. Each shop shall prepare an itemized Hurricane Security Bill as provided for in the basic Instruction. Distribution will be as follows: Shop (1), Area Organization Board (1), Zone Organization Board (1), Department Fire and Hurricane Staff Assistant (1).

NOTE: 1. Some shops will be required to assign personnel to Damage Control Gear Lockers. These personnel will be referred to as Ready Rescue Teams and will function as such on an immediate need basis. Ready Rescue Teams will normally supplement Area Emergency Rescue Support Teams when the latter is on scene.

NOTE: 2. When electrical storms cause power outage, electrical power is temporarily lost or some emergency requires the securing of electrical equipment, personnel assigned to such essential equipment will secure same immediately. The Zone Fire and Hurricane Marshal will personally coordinate the restoration of equipment to service after ascertaining from Plant Services (phone 729) that the problem causing the power outage has been corrected.

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O&R DEPARTMENT HURRICANE SECURITY, AIRCRAFT HURRICANE EVACUATION, AND STORM SECURITY BILLS

PART I - HURRICANE SECURITY

A. GENERAL

1. The Overhaul and Repair Department will take precautionary security measures for the zones shown on enclosure (1) to the basic Instruction and the buildings listed below:

Building Number	Designation
101	Overhaul and Repair Building
101-D	Air Conditioning Building
101-F	Oxygen Overhaul
101-G	Paint and Dope Storage
101-K	CO_2 Storage
101-N	Ordnance Facilities
101-P	Range Building
101-R	Flammable Stores Warehouse
101-S	Disassembly Building
101-T	Cleaning Building
101-U	Avionics Building
101-V	Plant Maintenance Building
101-X	Acetylene Generator
102	Engine Test Cells
102A - 102E	Gasoline Storage Tanks
108	Preservation Facilities
122	Seaplane Hangar
125	Battery Shop
146	Ready Ammunition Locker
167	Materials Engineering Division
183	Seaplane Ramp
189	Battery Charging Facility
190	Aircraft Cleaning Shed
266 (Structure)	Aircraft Power Check Facility
1617	Flight Test Line Shack (North of railroad)
1884	Electronics Storage (Avionics) (North wing and North portion of East wing)
1927	Sand Hopper
1928	Sand Hopper
202	Control House, Jet Engine Test Cell
202 A&B	Jet Engine Test Cells
202 C&D	Fuel Tanks
1562	Storage Building

[illegible]

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[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

Building Number (Contd)	Designation (Contd)
1710	Storage Building
201	Storage Building, Jet Test Cell Equipment
1570	Storage Building, Magnetic Detection Equipment

2. Hurricane Conditions. These include the following:

a. Seasonal Condition (1 June - 30 November). The department will survey requirements for security and maintain the buildings and area in full operations, but fully equipped for storm security.

b. Condition IV. (Possible threat of destructive winds within 72 hours.) Initiate preliminary precautionary measures. Continue general operations.

c. Condition III. (Possible destructive winds within 48 hours.) Continue preliminary security measures. Continue general operations.

d. Condition II. (Destructive winds are anticipated within 24 hours.)

(1) Take security measures which will allow the department to secure within 12 hours. Continue feasible operations.

(2) When winds of destructive force are expected to reach the local area within 12 hours, the Executive Officer will order the complete securing of the station.

e. Condition I. (Destructive winds are imminent.) Take all possible precautions to safeguard personnel and material.

3. Reports. The O&R Fire and Hurricane Marshal will assure that the following telephone reports are made:

a. A report to the Executive Officer, on or prior to 1 June each year, that requirements for hurricane season condition have been met.

b. A report to the Officer-of-the-Day, during Condition II, when such measures have been taken which would enable the O&R Department to secure completely within 12 hours.

c. When complete security of the department is assured, a report to the Hurricane Officer in the OOD's office (extension 207/210).

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[illegible]

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[illegible]

[illegible]

4. Responsibility. The Zone Fire and Hurricane Marshal or his Alternate shall insure that his zone is in readiness for each hurricane or storm condition as set and that the responsible supervisors in the administrative chain of command have taken every possible precaution that will minimize damage to aircraft, material, shops and spaces, etc., under their cognizance. The hurricane condition set is indicative of the time element remaining until winds of destructive force might threaten the local area and therefore governs the scheduling of items to be secured.

a. Seasonal Condition

(1) All externally stored items reviewed by cognizant groups prior to 1 June with view toward minimizing this category by reducing backlogs, scrap, salvage, or moving to protected storage. Remaining noncurrent material should be protected and completely secured.

(2) Zone Fire and Hurricane Marshals will make a complete zone inspection listing discrepancies in hurricane security in need of correction by Plant Services Division or Public Works (i.e., broken windows, etc.). These lists will be submitted to Plant Services Division for coordination prior to 1 June. Additional discrepancies shall be brought to the attention of cognizant group heads by memorandum for correction, with a copy of the memorandum to the O&R Fire and Hurricane Marshal.

(3) Each Zone Fire and Hurricane Marshal will inspect special hurricane security gear and other material required for assuming Condition II. It must be properly tagged, stowed, and in sufficient quantity for immediate needs. Replenish all deficiencies. Report prior to 1 June to the Fire and Hurricane Marshal when this inspection is complete and the lockers contain the required material.

(4) The Departmental Fire and Hurricane Marshal will report to the O&R Officer when the requirements of the hurricane season have been met. The O&R Officer will so notify the Executive Officer on or before 1 June.

b. Condition IV

(1) Basically, such items will be secured by cognizant groups that complete security can be attained within 48 hours.

(2) Cognizant groups will police their areas for debris and loose items.

(3) Zone Fire and Hurricane Marshals will inspect their zones, reporting immediately those items in need of correction to the responsible supervisor of the area concerned. Zone Fire and Hurricane Marshals will report by phone (extension 279/712) when Condition IV security requirements are met in his zone.

c. Condition III

(1) Cognizant groups will attain a degree of security such that complete security can be attained within 24 hours.

(2) Zone Fire and Hurricane Marshals will inspect their areas, reporting discrepancies to responsible supervision for correction. A telephone report will be made to Hurricane Central (extension 279/712) when Condition III security requirements are met.

(3) Zone Fire and Hurricane Marshals will assign a telephone watch and notify Hurricane Central of the extension number.

d. Condition II

(1) Generally, upon assumption of Condition II, the Production Manager and the O&R Officer will determine upon a time of cessation of general operations in order to assure complete department security within 12 hours. At this time aircraft stacking (see Part II, Aircraft Hurricane Evacuation Bill) is usually initiated.

(2) All personnel are available to and will report to their Sub-Zone Fire and Hurricane Marshal as required for working parties.

(3) The Aircraft Transfer Officer will assign 5 percent of his enlisted personnel complement to report to the Chief Master-at-Arms, Barracks "D" for duty in emergency working parties. The station OOD will notify the department when these men are required.

(4) When Condition II security requirements are met, Zone Fire and Hurricane Marshals will so report to the Hurricane Central (extension 279/712). When Condition II security requirements are met throughout the department, the station OOD will be notified by O&R Fire and Hurricane Marshal or his Alternate.

(5) When destructive winds are expected to reach the local area within 12 hours, the Executive Officer will order the complete securing of the station.

PART II - AIRCRAFT HURRICANE EVACUATION BILL

A. GENERAL

1. Reference (e) of the basic Instruction is applicable to the O&R Department although there normally will be no evacuation of aircraft of the department; they will be stored within the assigned hangar spaces, thus becoming part of the Hurricane Security Bill.

2. The following local action is appropriate to the aircraft hurricane evacuation condition set:

a. Condition IV (72 hours prior to forecast arrival)

(1) Continue flight operations.

(2) O&R Fire and Hurricane Marshal will submit Hurricane Evacuation Data Report (Form OP ATC 3730/1) to HECO (building 118, room 201).

b. Condition III (48 hours prior to forecast arrival)

(1) Secure flight operations except locals by special permission of the station Operations Officer.

(2) Hurricane Security Officer will submit revised Hurricane Evacuation Data Report to HECO by special messenger (even though no changes have occurred).

(3) O&R Fire and Hurricane Marshal will make advance plans for storage of all aircraft.

(a) Dispatch Division Superintendent will report to the O&R Fire and Hurricane Marshal to act as a special assistant in the coordination of aircraft storage (transportation, move crews, etc.).

(b) Hold pre-storage conference and briefing with layout boards attended by hurricane aircraft storage team.

(c) Notify station HECO of areas for aircraft storage surplus to O&R needs. Receive extra aircraft storage assignment from HECO, and hold coordination conference with custodian of assigned aircraft regarding location of storage, schedule, and areas of responsibility, i.e., moving and hangaring the aircraft.

c. <u>Condition II</u> (24 hours prior to forecast arrival)

(1) Hold final storage conference, assigning personnel, equipment, and move crews to each storage area. Coordination is achieved through Hurricane Central (extension 279/712).

(2) Commence storage when directed by the O&R Officer.

(3) Coordinate final storage requirements with HECO, attempting to retain all surplus area in a central location where it will be available to the Fleet (i.e., east end of 101 and hangar 122).

d. <u>Condition I</u> (12 hours prior to forecast arrival). Assist HECO as able in storage of remaining aircraft. Secure unhangared aircraft in best possible manner; remove or secure loose gear.

B. <u>RESPONSIBILITY</u>

1. The following assignments are made to the hurricane aircraft storage team:

a. The O&R Fire and Hurricane Officer is responsible to the O&R Officer for the safe and expeditious storage of aircraft.

b. The Dispatch Division Superintendent (and assistant as required) will assist the Hurricane Security Officer, furnishing transportation and move crews, etc:

c. The Shops Group Manpower Section Supervisor will provide manpower coordination through Hurricane Central (extension 279/712).

(1) All personnel, regardless of group, are responsible to their Zone Fire and Hurricane Marshal during Hurricane Condition II and I.

(2) Aircraft Storage Officers will utilize manpower supplied by the Zone Fire and Hurricane Marshal of the area involved.

(3) Coordination and movement of manpower from zone to zone will be achieved through Hurricane Central (extension 279/712). Zone Marshals will assign a telephone watch and notify Hurricane Central of the extension number.

(4) Securing of personnel will be directed from Hurricane Central through the Zone Fire and Hurricane Marshal.

d. The following area supervisory assignments are made for aircraft storage:

Hangar	Principal	Alternate
101-W	5100 Branch Supervisor	5100 Branch Quarterman
101	5300 Branch Supervisor	5300 Branch Quarterman
101-S	3100 Branch Supervisor	3100 Branch Quarterman
122	5200 Branch Supervisor	2100 Branch Supervisor

e. As each hangar area is stored and security completed, a report will be made to Hurricane Central (extension 279/712).

PART III - STORM SECURITY BILL

A. GENERAL

1. The basic organization established in Part I, Hurricane Security Bill, is responsible in like manner for the implementation of this Bill.

2. Reference (f) of the basic Instruction contains the following conditions:

a. Gale/Storm Condition IV (Use applicable term). Trend indicates a possible threat of destructive winds of force indicated within 72 hours.

b. Gale/Storm Condition III (Use applicable term). Destructive winds of force indicated are possible within 48 hours. Take preliminary precautions.

c. Thunderstorm/Tornado/Gale/Storm Condition II (Use applicable term). Destructive winds of force indicated are anticipated within 24 hours, or, in the case of thunderstorms or tornadoes, are reported or expected in the general area. Take precautions that will permit establishment of an appropriate Condition of Readiness on short notice.

(1) II CHARLIE. Winds up to 33 knots are anticipated in the local area within 24 hours; take such precautions as may be necessary.

(2) II BRAVO. Winds between 34 and 47 knots are anticipated in the local area within 24 hours. Take precautions necessary to provide adequate protection.

[illegible]

(3) II ALFA. Destructive winds 48 knots or greater of force and type indicated are anticipated within 24 hours. Take appropriate precautions to minimize damage. NOTE: When Condition II ALFA is set, a complete storm description will accompany the setting of the condition.

d. Thunderstorm/Tornado/Gale/Storm Condition I (Use applicable term). Destructive winds of force indicated are imminent. Take appropriate precautions to minimize damage.

(1) I CHARLIE. Winds up to 33 knots are in the local area; take such precautions as may be necessary.

(2) I BRAVO. Winds between 34 and 47 knots are in the local area. Take precautions necessary to provide adequate protection.

(3) I ALFA. Destructive winds 48 knots or greater of force and type as indicated are imminent. Take appropriate precautions to minimize damage. NOTE: When Condition I ALFA is set, a complete storm description will accompany the setting of the condition.

B. RESPONSIBILITY

1. Hurricane Central will receive information on storm conditions from the O&R Security office and will relay it to Shops Group divisions and to the other groups.

2. All groups are responsible for security of aircraft, material, and areas under their cognizance as follows:

a. Condition IV. No action.

b. Condition III. Police area removing debris and checking security and protection of externally stored material.

c. Condition II (CHARLIE, BRAVO, or ALFA)

(1) Continue normal operations.

(2) Check that security of externally stored material is in conformity with expected winds.

(3) Tie down all exposed aircraft with wheels chocked.

d. Condition I CHARLIE (33 knots)

(1) Tie down all exposed aircraft with wheels chocked.

(2) Zone Fire and Hurricane Marshals check area for security.

e. Condition I BRAVO (34 to 47 knots)

(1) Secure exposed aircraft with double tie-down, wheel chocks secured to aircraft, helicopter blades secured.

(2) Zone Fire and Hurricane Marshals check area for security and report completion to Hurricane Central (extension 279/712).

f. Condition I ALFA (Destructive winds above 48 knots)

(1) Hangar all RFI helicopters and those having completed assembly (including FFT).

(2) Fixed wing aircraft headed into prevailing wind and secured as in subparagraph e(1) above.

(3) Zone Fire and Hurricane Marshal check area for security and report completion to Hurricane Central (extension 279/712).

g. Hail Warning. Will generally require action as in f(1) above, and may require more extensive security as detailed at the time.

3. Prior to completing work each workday, the area will be secured in conformity with the requirements of Storm Condition II.

O&R DISASTER WARNING SIGNALS

The term disaster warning includes the terms Fire Alarm, Emergency Signal for impending attack, and Hurricane Warning Signals as appropriate. These alarm signals should be prominently posted in all shops and on all bulletin boards adjacent to Disaster Control Bills:

SECTION I: EMERGENCY SIGNALS AND ACTIONS

	SIGNALS	ACTIONS
ALERT	A steady blast of 3 to 5 minutes. (Steam whistles will sound at NAS Power Plant No. 2 and at the Naval Hospital Power House. A horn signal will sound in O&R bldg. 101 and Hanger 101-A. Audible signals will be backed up by oral instructions passed by telephone and by security patrol cars.)	This signal means that attack by hostile aircraft is probable. On this signal NAS Station personnel assigned to active defense duties, security guards, fire-fighting personnel, personnel required for operating or securing utility systems and those required to perform other essential functions will remain at their duty stations. NAS Station Disaster Control Groups will muster at pre-designated martial points, obtain team equipment and await further instructions. O&R Damage Control personnel will place Departmental Damage Control Bills in effect, after which those specifically designated to take shelter in the area will do so. All other civilian and military personnel not included above should evacuate the station immediately and report to evacuee assembly area, NRTC Gainesville, Florida. (See NAS JAX Evacuation Chart posted throughout the station.)
TAKE	A series of short blasts of 3 minutes duration. (Warning will be passed in the same manner as above.)	This signal means that attack by hostile aircraft is imminent or is taking place.

C O V E R

All personnel should seek immediate shelter. If no warning is given and a blinding flash or a tremendous earth shock is experienced and you are - - -.

IN A BUILDING - Seek an interior corridor or room with a small window area and lie face down on the floor alongside a wall or under a heavy desk or table.

OUTSIDE - Lie face down, preferable in a ditch or depression on the ground with hands covering the back of the head.

IN A CAR - Open the windows to reduce the danger from flying glass and lie down on the floor boards.

Buildings designated as shelters are indicated on NAS JAX Evacuation Chart posted throughout the station.

- -

A L L C L E A R

There is no audible ALL CLEAR signal. Oral instructions will be passed by security patrol cars or by telephone when danger is over.

Do NOT leave shelters or the evacuation area until told to do so. Fall-out or further attacks may occur.
The ALL CLEAR will also be broadcast by commercial radio. In this area tune radios to 640 or 1240 KC.

- -

SECTION II: O&R DISASTER OR FIRE ALARM SIGNALS

a. Devices----Station level 1: Signal is audible only at control points and not throughout the station.

b. Devices within O&R ----Fire signals (Bells except zone 224) sounded after the alarm has been turned in are as follows:

AREA	SIGNAL	ALL CLEAR SIGNAL
I	A series of very short rings evenly distributed.	
II	A series of very short rings grouped in two's.	

	SIGNAL	ALL CLEAR SIGNAL
ZONE		
341, 342 343, 345 346, 347 348, 349	Short rings on the work bell equivalent to the number of the subzone. Subzone number will normally be sounded 3 times.	3 short rings on the work bell sounded once.
224	4 short blasts on the air horn to be sounded 3 times.	3 short blasts on the air horn sounded once.
Emergency Rescue Crew	Fire Bells in Plant Services sounded by O&R Security to correspond with appropriate fire zone signal.	
SUBZONE		
227	7 short rings on the work bell to be sounded 3 times.	3 short rings on the work bell to be sounded once.
336	6 short rings on the alarm bell to be sounded 3 times.	3 short rings on the bell to be sounded once.

ACTION: Personnel assigned Fire Stations will man their stations. All personnel within the affected zone will become alert but continue operations until further notice. Shop Damage Control personnel will activate shop, zone or area damage control measures when directed. All other personnel within an affected shop, zone or area will evacuate when directed.

SECTION III: HURRICANE WARNING SIGNALS AND PROCEDURES

The Overhaul and Repair Security Office will act as a Department Duty Office in receipt and dissemination of hurricane security condition information:

a. During working hours the Security Office will notify the O&R Officer, Assistant O&R Officer, and O&R Fire and Hurricane Marshal (Shops Officer) on receipt of hurricane information. The Shops Group Office (Hurricane Central) will notify (1) all Disaster Control Area Coordinators and/or alternates (2) all O&R Department group heads (3) all Shops Group division superintendents.

b. During non-working hours the Security Office will notify the O&R Officer, Assistant O&R Officer, and O&R Fire and Hurricane Marshal when Hurricane Conditions IV, III, II, and I are set and the Aircraft Transfer Officer when Hurricane Evacuation Condition II is set. All departmental personnel required for security may be recalled.

ADMINISTRATIVE AND OPERATIONAL INSPECTION FORM
FOR DISASTER CONTROL TEAMS
AREA LEVEL AND BELOW

A. ADMINISTRATIVE

1. Area Coordinator

(a) Has the Area Coordinator prepared and located area Disaster Control Organization Bills? Yes___ No___

(b) Is the Area Coordinator cognizant of Distaster Control Organizational Boards, Drawings, and Bills within his various zones? Yes___ No___

(c) Have review requirements for personnel assignments to Disaster Control Bills been established? Yes___ No___

(d) Have Zone Damage Control gear material requirements been reviewed? Yes___ No___

(e) Does the Area Coordinator have a feeling for the most important drills within his area that should be conducted? Yes___ No___

(f) Has a drill been scheduled in the past quarter? Yes___ No___

2. Support Teams

(a) First Aid

(1) Is the First Aid Team Leader aware of his team compliment? Yes___ No___

(2) Are records on training being kept for qualification purposes? Yes___ No___

(3) Are custody records kept of First Aid equipment? Yes___ No___

(4) Are inventories made of supplies? Yes___ No___

(5) Is storage adequate? Yes___ No___

(6) Does the First Aid Team Leader understand who he is responsible to, and when? Yes___ No___

(7) Are First Aid Team Members evenly distributed among the various zones? Yes___ No___

(b) Emergency Rescue

(1) Is the Team Leader aware of the compliment of his team? Yes___ No___

(2) Is training in rescue techniques being conducted and records being kept? Yes___ No___

(3) Is Emergency rescue equipment mobile, and is it readily available? Yes___ No___

(4) Has the Team Leader reviewed material requirements for Zone Damage Control Gear Lockers and made additional needs known to the Departmental Disaster Control Staff Assistant? Yes___ No___

(5) Does the Team Leader know who he is responsible to, and when? Yes___ No___

(6) Do Team Members understand what their function is? Yes___ No___

(c) Area Communication and Traffic Team

(1) Does the Team Leader understand the compliment of his team? Yes___ No___

(2) Are training requirements being established? Yes___ No___

(3) Do Team Members understand their function? Yes___ No___

(4) Does the Team Leader understand who he is responsible to, and when? Yes___ No___

3. Zone Fire and Hurricane Marshal

(a) Has the Marshal developed Disaster Control Bills, training, and equipment requirements for his zone? Yes___ No___

(b) Are Zone Disaster Control Organization Boards properly prepared and prominently located? Yes___ No___

(c) Have material requirements for Disaster Control Gear Lockers been developed so as to provide for unique rescue? Yes___ No___

(d) Does the Marshal understand the organizational relationships of the Bill? Yes___ No___

(e) Does the Marshal have ideas concerning drills which should be conducted? Yes___ No___

(f) Are results of monthly fire equipment inspections reported monthly, and to whom? Yes___ No___. ___________________

(g) What plans has the Marshal initiated for the use of his assigned personnel to effect hurricane security? ___________________
____.

4. Fire Team Leaders

(a) Does the Fire Team Leader understand his responsibility concerning functional control of assigned fire fighting personnel? Yes___ No___

(b) Are Zone fire fighting personnel properly trained in the use of equipment? Yes___ No___

5. Damage Control Team

(a) Does the Damage Control Team Leader understand the functions of personnel assigned to the Damage Control Stations within the zone? Yes___ No___

(b) Are Damage Control Training Plans being implemented? Yes___ No___

(c) Has equipment requiring attention been properly labeled as to action required? Yes___ No___

(d) Has the Team Leader prepared or reviewed a list of equipment and facilities found within his zone which require some type of attention in the event of emergency? Yes___ No___

[illegible]

(e) Does the Damage Control Team Leader understand the criteria for establishing such a list? Yes___ No___

6. Shop Supervisors

(a) Did the Shop Supervisor assist in the preparation of the Disaster Control Equipment and Facilities survey? Yes___ No___

(b) Did the Shop Supervisor assist in the preparation of material for Disaster Control Gear Lockers? Yes___ No___

(c) Are Disaster Control Bills prominently posted within each shop? Yes___ No___

(d) Has the Shop Supervisor explained necessary portions of Disaster Control Instruction to his assigned personnel? Yes___ No___

(e) Does the Shop Supervisor understand his responsibilities concerning the function and control of personnel assigned to Shop Disaster Control Bill? Yes___ No___

7. Security Force

(a) Does the Security Force understand the proper method of sounding Disaster Control alarms? Yes___ No___, Fire alarms? Yes___ No___, Alarm signals throughout the Department? Yes___ No___.

(b) Do the Security Guards understand their responsibilities for providing communication capabilities to appropriate mobilization points in the event of an alert? Yes___ No___

(c) Does the Security Department understand their responsibilities for reporting fire and damage hazards? Yes___ No___

8. Shops Personnel

(a) Do personnel understand their assignments to Disaster Control Stations? Yes___ No___

(b) Do personnel understand when and where to evacuate if directed? Yes___ No___. Are alarm signals understood? Yes___ No___

(c) Do Shops Personnel understand the Damage Control coding system (this is not expected to be memorized)? Yes___ No___

(d) Do personnel assigned to Disaster Control Gear Lockers understand the use of the equipment within these lockers? Yes___ No___ Do they understand their function? Yes___ No___

(e) Do personnel understand what to do in the event of electrical storm? Yes___ No___

B. OPERATIONAL

It is contemplated that three basic drills will be carried out, as follows:

1. A very small fire within a designated shop.
2. A larger fire within a shop which could progress into a zone emergency.

3. A zone emergency which could progress into an area emergency. Each circumstance will be separate and distinct.

Type Drill--Minor Shop ____________________
Major Shop ____________________
Zone Emergency ____________________
Area Emergency ____________________

Specify situations enacted--Fire ____________________
Explosion ____________________
Electrical Outage ____________________
Injured Man--Shock ____________________
Burn ____________________
Area Alert--30 Minutes ____________
Take cover ____________

Shop Supervisor ____________________
Fire Team Leader ____________________
Damage Control Leader ____________________
Zone Marshal ____________________
Area Coordinator ____________________

Drill Evaluation ____________________
____

Training Recommendations ____________________
____
____

The response to the following items will be noted and evaluated:

1. Did Shops Personnel react immediately? Yes___ No___

2. Did the Shops Supervisor place his Fire and Disaster Control Bill into effect? Yes___ No___

3. Was the incident reported to the Fire Department? Yes___ No___
By whom? ____________________

4. Did the Shop Supervisor secure his shop, or any other shop? Yes___ No___

Evaluate the judgment used by the Supervisor concerning the securing of his shop. ____________________

5. Did Zone Fire and Damage Control Team Leaders assume functional control of all personnel assigned to their Disaster Control Team? Yes___ No___

6. Did the Zone Fire and Hurricane Marshal control the function of the Zone Teams? Yes___ No___

7. How were Zone Team functions coordinated? ____________________
____

8. Did the Marshal secure the entire Zone or any other Zone? Yes___ No___. Evaluate the judgment exercised by the Zone Fire and Hurricane Marshal. ___________________________

9. Were Communication and Traffic Teams utilized? Yes___ No___
How? ___________________________

10. Did the Emergency Rescue Support Team report to the scene? Yes___ No___. Who did they report to? ______________
Did they assume control of Disaster Control Ready Rescue Teams? Yes___ No___. How? ___________________________

11. Was emergency rescue equipment readily available and properly utilized? Yes___ No___

12. Did First Aid Team Members report to the scene? Yes___ No___
What were their actions? ___________________________

13. Did the Security Guard with Handy-Talkie report to the Area Mobilization Point? Yes___ No___. Was he utilized? Yes ___ No ___
How? ___________________________

14. Was the Disaster Control Area Coordinator kept informed of the progress of the incident? Yes___ No___

15. Did the Area Coordinator assume operational control of the members of his support team? Yes___ No___. Evaluate the judgment of the Area Coordinator concerning the use of his assigned personnel. ___________________________
Was the Area secured? Yes___ No___

16. Did the Area Coordinator keep departmental staff informed of the progress of the incident? Yes___ No___. How? ___________________________

17. Did he request assistance? Yes___ No___. If so, what type? ___________________________

18. Did the O&R Disaster Control Officer assume control of either Area Disaster Control Group? Yes___ No___. Evaluate his actions. ___________________________

Drill Evaluation:

Training Recommendations:

[illegible]

APPENDIX B

1. Name of Company____

2. Principal Product ____

3. Size of Company

a. No. of Buildings (if company is located in more than 1 city, please give comparative average figure____________________

b. Production floor space ____________________

c. Estimate of Capital Investment____________________

d. No. of employees ____________________

(1) % of employees involved in indirect labor__________

(2) % of employees involved in direct labor__________

e. No. of shifts of operation____________________

f. Hours per shift/week____________________

g. Percent government contracts of total business __________

4. Major Production Operation(s). Underline one or more each line.

a. Assembly, Fabrication, Job Shop, Machinery, Processing, other ____

b. Metal, Wood, Plastic, Chemicals, Paper, Foodstuff, Petroleum Products, Gas, other____

c. Classification of Production Hazard: Non-Hazardous, Ultra Hazardous, Hazardous.

5. Geographical Location

Where is plant located in terms of city, rural, river-bottom,

near airport____

Are special precautions required and taken for plant and employee protection because of geographical location susceptible to Fire, Flood, Earthquake, Hurricane, Explosion, Tornado, etc.______________

____

a. Which factor(s) do you consider worthy of consideration______

____

____

b. What precaution(s) have you taken__________________________

____

____

6. Safety Programs

a. Briefly describe programs in force (First-Aid, Industrial Safety, Fire Prevention, Disaster Control, other_________________

____

____

b. Organizational assignments for Program(s) responsibilities--who in the line/staff company organization is responsible for what

____

____

____

c. Are instructions and procedures in force promulgating program requirements____

d. Are courses, drills, other instructional programs conducted with respect to programs in force____________________________

(1) How often and for what length of time________________

____

(2) How are drills simulated_________________________________

____

____

e. Do employees participate as members of First-Aid Teams, Disaster Control Teams______________________________________

If yes, what team(s) and what participation________________

____

f. What is extent of First-Aid or medical facility available

(1) First-Aid Chests or Lockers__________________________

(2) Dispensary____

(3) Nurse(s) on Duty____

(4) Doctor(s) on Duty_______________________________________

(5) Other____

g. What types of Fire Protection equipment do you utilize

(1) CO_2 or Chemical Extinguishers________________________

(2) Sprinkler System____

(3) Fire Hose Reels____

(4) Fire Truck(s)____

(5) Full time Company Fire Dept.____________________________

7. <u>External Services</u>

a. What Medical, Fire, and other services are available from the

community in case of accident, injury, fire, or disaster within plant

____

____

b. With respect to time, approximately how fast is each outside service able to respond to a call for assistance________________

c. Is there an established plan or program for mutual cooperation between industries and the community in the event of a large scale disaster____

d. Describe your plant participation in Civil Defense Program. In the event of warning for all-out attack, do you have written instructions which deal with the securing of the plant and its equipment (a passive measure to reduce possible damage)___________

____

____

8. Statistics

a. What has been the yearly average number of lost time accidents and incidents at your plant_________________________________

b. What has this constituted in lost man-hours________________

____

c. Were estimates made as to dollar impact on production_______

d. Comment on recent significant lost time occurrence__________

____

____

e. Describe one or more fires in your plant in terms of property

loss, cause, to what extent or lack of same working personnel assisted in controlling the emergency: other assistance and was assistance pre-organized______________________________

____

____

9. <u>Insurance</u>

a. Is company self-insured or insured through insurance underwriter____________________________________

b. What is approximate extent of insurance for personnel liability

____

c. What is approximate extent of insurance for investment protection____________________________________

d. Has there been any tendency for insurance rates to climb or fall during the past five to ten years and to what is the change attributed to________________________________

10. Do we have permission to quote the above information directly with your company name or do you prefer the information provided be treated confidentially.______________________________

____